STATUS OF INDUSTRIAL WATER POLLUTION CONTROL IN ONTARIO

December 1973

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Ministry of the Environment

The Honourable
William G. Newman
Minister

Everett Biggs,
Deputy Minister

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1973

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OF
INDUSTRIAL WATER POLLUTION CONTROL
IN
ONTARIO

As of December 1973

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INTRODUCTION

This report is the fifth of a series relating to the status of industrial water pollution in Ontario.

The format of this report follows closely that of the 1971 report and reviews the progress achieved in the areas of concern expressed at that time. New areas of concern are discussed where appropriate.

With the impending reorganization of the Ministry, the report will also serve to acquaint persons not previously associated with the industrial wastes control programs but now having responsibilities in this area, with the general problems yet to be resolved. To this end, a section has been added which discusses a number of the more important industrial categories and some of the specific problem areas.

Certain limitations of the data contained in this report should be noted to ensure that results and information will be interpreted correctly.

(1) Reliability of Data

The data presented in the report represent the best up-to-date factual information available. It must be appreciated that not all specific contaminants or pollutants are necessarily monitored for every industrial discharge. In general, only those contaminants which are considered significant in a particular industrial grouping are monitored and the data presented as totals for the Province realistically represent totals from major sources. Low concentrations of contaminants in large volumes of wastewaters could contribute substantial increases to the waste loadings if they were monitored.

(2) Restrictiveness of Data

Only data relating to direct industrial discharges to surface waters in Ontario have been given in-depth analysis in this report. Although a substantial portion

of the workload for staff is associated with the problems caused by industrial discharges to municipal sewer systems, it has not been possible to include an assessment on the effects on surface waters of these wastes as they are subsequently discharged in the treated form from municipal sewerage systems. Also, data concerning industrial discharges to land disposal systems are lacking and it is known that such discharges can potentially create secondary water pollution problems.

The implementation of an Automated Data Processing system should enable more comprehensive monitoring and surveillance programs to be undertaken and consequently provide greater reliability to data used in this report.

SUMMARY

Approximately 480 Industries Discharging to Watercourses

(1) At the end of 1973, 484 industrial plants were discharging effluents directly to watercourses. This figure is slightly lower than the corresponding figure for 1971 and the difference is due to industries developing non-effluent systems or discharging wastes to municipal sewage systems for treatment. Industries with non-effluent systems totalled 528. The Ministry only inspected 360 industries discharging to municipal sewer systems in 1973, the decrease being due to complete inspections by Regional and other municipalities.

Seventy Percent of Industries Meeting Effluent Requirements

(2) Approximately 70 percent of the industries which discharge effluents directly to watercourses have acceptable means of waste control and generally meet current MOE requirements (Table 1).

(3) A major increase in wastewater flows is noted for 1973 due to the inclusion for the first time of thermal electric power generating cooling water discharges. Normal industrial waste effluent flows decreased by a small amount compared to 1971.

Suspended Solids and BOD_5 Reduced

(4) Compared to 1971, suspended solids discharges have been reduced by 34 percent and BOD_5 by 12 percent. Inaccuracies in 1971 data and improved measurement by 1973 for many of the other parameters make further comparisons impossible (Table II).

Primary Resource Based Industries still Major Polluters

(5) Of the total industrial wastes loadings discharged to rivers and lakes, the pulp and paper industry continues to discharge the bulk of the BOD_5 (88 percent) and the bulk of the suspended solids (60 percent). The steel industry is responsible for 77 percent of the oily waste discharges and 87 percent of the metal losses (mostly iron). Losses of other metals (zinc, copper, lead) occur mostly in the mining industry (11 percent). (Figures 1 and 2)

Pulp and Paper - still a Major Problem

(6) Pollution abatement in the pulp and paper industry continues at a slow rate. With the recent improvements in the financial status of this industry, the rate of progress should improve in the immediate future. Waste liquors from sulphite pulping facilities create the greatest problem but the recent energy crisis and the increase in fuel costs are expected to improve the economics of chemical recovery systems.

Areas of Concern

(7) Although progress has been made, many of the technical problems and areas of concern, highlighted in 1971 remain, and further research, investigation and proper policy and planning are needed to arrive at suitable solutions. Such areas of concern include thermal pollution, heavy metals, toxicity in pulp mill effluents, siting of major industrial developments with respect to environmental impact, financial incentives to industry for pollution control facilities and surveillance of

radioactive discharges from nuclear generating stations and other nuclear facilities.

Federal Regulations

(8) Regulations under the Fisheries Act have been promulgated for the Pulp and Paper Industry and the Petroleum Refining Industry. Regulations for the Mining Industry, Metal Fabricating and Finishing, the Textile Industry and the Meat Packing Industry are under development at present. During the next three to four years, Environment Canada plans to develop regulations for most industrial categories.

The Control of Industrial Discharges to Municipal Sewer Systems continues to present Problems

(9) The discharge of industrial wastes to municipal sewerage systems for treatment continues to cause a number of technical and administrative problems. Agreement between municipalities and the Ministry on a uniform model, sewer-use by-law has not been reached. As a result, variable sewer-use by-law limits on specific contaminants exist in different municipalities. Inconsistent by-law enforcement and differing surcharge levies for overstrength wastes require further attention (Table V).

Pollution Abatement Expenditures by Industry for Period 1957-1973 in excess of $300 million

(10) Since December 1971, the Ministry has issued 194 certificates of approval for industrial waste treatment facilities for an estimated total cost of approximately $95 million. This raises the total estimated industrial expenditures for pollution control for the period 1957-1973 to a valve in excess of $300

million. Costs incurred by industry for constructing pretreatment works for high-strength wastes prior to discharge to municipal sewer systems and costs incurred in jointly shared municipal industrial treatment works have not been included in the above estimate (Table VI, Figures 3 and 4).

Rate of Spending for Pollution Control has increased in 1972-73

(11) Although monies are not necessarily spent in the same year as approval is granted, the estimates indicate that the rate of spending for pollution control has risen. During 1973, approvals were granted for treatment works with an assessed valve in excess of $50 million. This compares with an average expenditure of approximately $15 million per annum previously. Projected estimates for 1974 are $40 - $50 million.

Abatement Costs Estimated at $230 million to clean-up existing pollution

(12) Estimated costs to abate existing industrial water pollution in Ontario are in the order of $230 million (December 1973). It is interesting to note that better than half of this cost is associated with the pulp and paper industry. Also, about $140 million of the $230 million are required by industries located in the Lower Great Lakes drainage basin (Table VII, Figure 5).

Legal Activities

(13) Legal activities declined during the period 1972-73. There were six prosecutions during this period and two Ministerial orders were issued. Since 1965, when the industrial control program was first

recognized as a high priority issue in the overall water pollution control program of the former OWRC, 62 companies have been prosecuted and 34 orders have been issued. Of a total of 95 charges, there have been 81 convictions for fines totalling $31,955. This is equivalent to an average fine of $395.00 per conviction (Table VII, Figure 6).

Spills of Petroleum Products and Chemicals constitute Significant Pollution Load

(14) Since 1971, the total number of spill incidents reported to the Ministry has increased dramatically to approximately 500 for the year 1972 and 700 during 1973. Eleven of the 1973 spills were classified as major incidents involving petroleum products and chemicals. Equipment failure and negligence have been determined to be the main reasons for these spills. Traffic accidents, with an increasing number of "Pup" trailers being involved, account for a substantial number of spills. The increases in reporting are attributed to an ever increasing awareness by industry of its responsibilities to report spill incidents, regardless of the size or nature.

Contingency Planning

(15) A "Status Report, May 1973" was published which highlighted several newly-developed concepts in the field of contingency planning. Ontario, through the Ministry, has made certain commitments of response participation under the Canada-U.S., and the Federal contingency plans. Negotiations were also initiated for the development of a joint Ontario-Quebec Contingency Plan.

EDP Systems developed for Industrial Wastes Control

(16) A feasibility study performed in 1972 showed that automated data processing systems would benefit the Industrial Wastes Branch control programs and design of the necessary systems was implemented. The basic purpose of the system is to supply readily information on all facets of industrial wastes control in the Province.

TABLE I

DEGREE OF COMPLIANCE BY INDUSTRIAL GROUPS WITH MINISTRY OF THE ENVIRONMENT EFFLUENT REQUIREMENTS AS OF DECEMBER 1973

Industry Group	Number of Plants Discharging Directly to Watercourses	Number of Plants Meeting Requirements	Percentage Meeting Requirements
Basic Iron and Steel	7	4	57.1
Chemicals	45	25	55.6
Food Processing	82	53	64.6
Metal Plating and Finishing	101	83	82.2
Mining and Metallurgical	89	59	66.3
Miscellaneous Manufacturing	60	54	90.0
Petroleum and Petrochemical	30	20	66.7
Pulp and Paper	32	5	15.6
Service*	26	23	88.5
Tanning and Rendering	4	2	50.0
Textiles	8	5	68.8
Total	484	333	68.8

(a) Numbers of Industries with Non-Effluent Systems: 528

(b) Industries Discharging to Municipal Sewerage Systems: 360

*Includes Utilities and Transportation Industry.

TABLE II

INDUSTRIAL WASTE FLOWS AND CONTAMINANT LOADINGS TO NATURAL WATERCOURSES

	1971	1973	% Change
Waste Flows: 10^6 gals/day			
Industrial	2,110	2,059	- 2
Thermal Electric Power Generation	3,100	5,022	+ 62
Total	5,210	7,081	
Waste Loadings: 10^3 lbs/day			
BOD_5	2,360	2,066	- 12
Suspended Solids	1,370	908	- 34
Total Metals	41* *(48)*	62	+ 29**
Oils, fats, greases (ether solubles)	34* *(78)*	36	- 54**
Chlorides	7,600* *(8,400)*	7,800	- 7**
Total Nitrogen	135	126	- 7
Total Phosphorus	2	4	+100
Dissolved Solids	>12,000* *(>17,000)*	>21,000	
Phenolics	3	2	- 34
Sulphates	341*	731	+114

*1971 figures are thought to be incorrect or at least incomplete. Revised figures are listed below originally indicated figures (if recalculation was possible).

**Based on revised 1971 figures.

General comments regarding interpretation of data

(i) Present monitoring program is more sophisticated than the 1971 version.

(ii) Relative increases (and decreases) are the result of omissions in the 1971 monitoring program. In fact, several of the parameters listed were not monitored in some lake basins in 1971.

Major reasons for % changes between 1971 and 1973

Suspended Solids

(i) Installation of 8 clarifiers and 1 sedimentation lagoon by the pulp and paper industry.

(ii) Installation of a neutralization and settling pond at Dow has cut the suspended solids discharge to approximately ¼ of the 1971 values (25,000 lbs/day vs. 100,000 lbs/day).

Total Metals

(i) Increase (in iron) is mainly due to design and operational problems with the filtration plant at Dofasco.

Ether Solubles (Oils)

(i) Decrease is primarily due to the installation of an oil treatment plant and the control of batch processes at Stelco.

Phosphorus

(i) Part of the increase can be attributed to the way in which the phosphorus loading is determined. The technique involves calculating a difference between the flow coming in and going out of the plant. When dealing with a large flow (approaches 0.5 bgd at Stelco), an error of a fraction of a part/million in the data makes significant changes.

Cooling Water for Thermal Power Generation

(i) Douglas Point and Pickering Generating Stations are now operating fully with a combined demand of approximately 1,750 mgd.

Sulphates

(i) Increase mainly due to mining industry in the Lake Huron basin (no 1971 statistics were available for comparison).

TABLE III

DISCHARGES TO SURFACE WATERS IN ONTARIO BY MAJOR INDUSTRIAL GROUPS

Industry Group	Waste Flow mgd	Waste Loadings: 10^3 lbs/day BOD_5	Suspended Solids	Ether Solubles	Total Metals	Other Contaminants	
Basic Iron and Steel	654	75.4	210.2	27.5	53.9	Iron	53.9
						Phenol	1.4
						Total Phosphorus	1.3
						Total Nitrogen	32.0
						Cyanide	4.5
						Total Dissolved Solids	1,540.0
Chemicals	397	105.6	49.2	0.3	0.5	Chlorides	7,693.0
						Sulphates	156.0
						Total Nitrogen	45.0
						Dissolved Solids	13,700.0
						Total Phosphorus	0.4
						Phenol	0.05
Food Processing	31	47.0	20.9	0.02		Total Phosphorus	0.7
						Total Nitrogen	0.1
						COD	1.0
						Dissolved Solids	60.0
Metal Plating and Finishing	98	2.6	23.4	1.2	0.6	Chlorides	2.0
						Sulphates	23.0
						Fluorides	2.3
						Dissolved Solids	160.0
						Total Phosphorus	0.1
						Total Nitrogen	0.1
						Phenol	0.04
Mining and Metallurgical	148		37.4		6.9	Sulphates	531.0
						Chlorides	3.0
						Iron	4.2
						Arsenic	0.06
						Cyanide	1.6
						Dissolved Solids	470.0
						Total Nitrogen	43.0
Miscellaneous Manufacturing	20	1.2	1.0	0.02	0.0007	Chlorides	2.0
						Sulphates	1.0
						COD	1.0
						Dissolved Solids	2.0
						Total Nitrogen	0.8
Petroleum and Petrochemical	292	21.8	18.5	6.8	0.02	Chlorides	100.0
						Sulphates	20.0
						Total Nitrogen	5.0
						COD	120.0
						Dissolved Solids	310.0
						Total Phosphorus	0.2
						Phenol	0.9
Pulp and Paper	417	1,810.5	546.2		0.3	Dissolved Solids	5,140.0
						COD	25.0
						Total Phosphorus	0.8
						Phenol	0.015
Service*	5,022		0.4	0.001	0.01	Hydrogen Sulphide	0.3
						Dissolved Solids	3.0
Tanning and Rendering	0.3	0.8	0.5		0.001		
Textiles	2.0	0.7	0.2	0.002			
Total	7,081.3	2,065.6	907.9	35.843	62.2317		
Rounded	7,081	2,066	908	36	62		

	10^3 lbs/day	
Phenolics	2.0	
COD	154.0	
Cyanide	6.1	
Dissolved Solids (not including chlorides)	21,385.0	i.e., >21,000
Total Phosphorus	4.0	
Chlorides	7,800.0	
Sulphates	731.0	
Total Nitrogen	126.0	

Total Municipal (estimated)	860.0	240.0	210.0	
Total Agricultural and Pastoral Water Use	210.0			

*includes service and transportation industry.

FIGURE I

RELATIVE CONTRIBUTION OF CONTAMINANT LOADINGS BY INDUSTRIAL GROUPS

TABLE IV

INDUSTRIAL WASTE FLOWS AND CONTAMINANT LOADINGS TO MAJOR DRAINAGE BASINS

Drainage Basin	Flow (mgd)	Waste Loadings: 10^3 lbs/day							
		BOD_5	Suspended Solids	Ether Solubles	Chlorides	Sulphates	Total Metals	Total Phosphorus	Total Nitrogen
Hudson Bay/ Arctic	151	554	245			39	1.5		
Lake Superior	241	557	124			39.1	0.2		0.2
Lake Huron*	676	204	128	10.7	121.8	448.9	13.8	0.8	76.5
St. Clair River	1,305	76**	49	5.9	891.5	91.2	0.3	0.1	5.3
Lake St. Clair	9	2	2	0.1	12		0.04	0.3	
Detroit River	92	3	19	0.6	6,752.1	7	0.3	0.002	1.4
Lake Erie	478	5	8	0.002			0.3	0.1	0.05
Niagara River	33	0.3	7	0.15			1.8	0.5	27.1
Lake Ontario	3,941	218	265	18.4	19.7	40.5	43.6	1.7	2.7
St. Lawrence River	107	91	41			60	0.3	0.04	12.3
Ottawa River	48	356	20			5	0.2	0.04	
Total	7,081	2,066.3	908	35.9	7,797.1	730.7	62.34	3.582	125.55
Rounding	7,081	2,066	908	36	7,797	731	62	4	126

*Includes St. Mary's River

**Because of the complex nature of the waste discharges to the St. Clair River from the chemical industries, the BOD_5 may not give a full assessment of the oxygen demand characteristics. However, a total of 120,000 lb/day of COD is discharged which gives a better assessment of the oxygen demand characteristics of the various wastes.

FIGURE 2

RELATIVE CONTRIBUTION OF LOADINGS FROM INDUSTRY TO MAJOR DRAINAGE BASINS

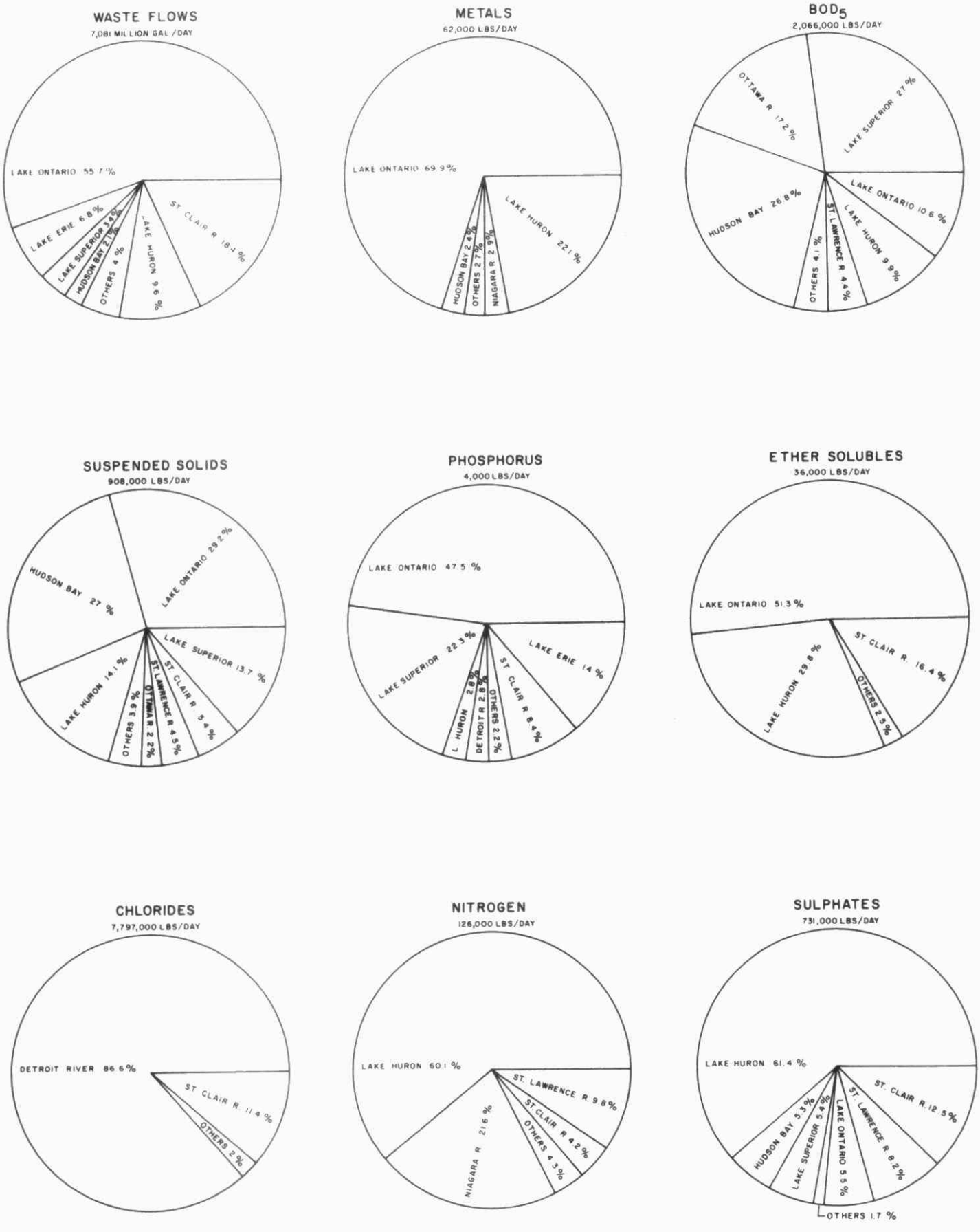


TABLE V

CONTROL OF INDUSTRIAL WASTES IN MUNICIPALITIES

SEWAGE WORKS

Municipalities having Sewage Works	247
Municipal Sewage Works	284

BY-LAWS

Municipalities having acceptable by-law	213
Municipalities which should enact a by-law	28

ENFORCEMENT

Municipalities not requiring enforcement programs	141
Municipalities with satisfactory enforcement programs	34
Municipalities with unsatisfactory or no enforcement programs	72
Municipalities with full-time enforcement staff	18
Municipalities with part-time enforcement staff	35
Municipalities with sampling equipment	35
Municipalities with analytical capability	16
Municipalities with regular sampling program	10
Municipalities with "as is required" sampling program	38

A comparison of these data with those presented in the 1971 Status Report is difficult due to the changes in the number of municipalities caused by Regionalization.

The relatively large number of municipalities not requiring an enforcement program (141 out of 247 with sewage works) is due to the large number having no significant industry and to the reduction of local municipalities through Regionalization by approximately 100, most of which had a significant amount of industry.

TABLE VI

ESTIMATED CAPITAL EXPENDITURES

FOR INDUSTRIAL WASTE TREATMENT WORKS

1957 - 1973

Industry Classification	10^3 1957-65	10^3 1965-73	Percentage of Total Cost 1965-73*	Number of Certificates 1965-73	10^3 1957-73
Basic Iron and Steel	5,390	34,180	16.1	39	39,570
Chemicals	8,563	15,718	7.4	150	24,281
Food Processing	1,018	7,025	3.3	121	8,043
Metal Working, Plating & Finishing	398	9,885	4.7	64	10,283
Mining and Metallurgical	21,941	62,161	29.3	108	84,102
Miscellaneous Manufacturing	3,433	11,983	5.6	86	15,416
Petroleum & Petrochemical	22,561	17,056	8.0	103	39,617
Pulp and Paper	33,952	39,797	18.7	56	73,749
Service	152	14,130	6.7	49	14,282
Tanning & Rendering	600	311	0.1	7	911
Textiles	52	208	0.1	4	260
	98,060**	212,454	100.0	787	310,514

* Percentage based on estimated costs for treatment works approved by Ministry to be spent by industry: July 1965 - December 1973.

** This total is based on figures presented by industry as having been spent prior to implementation of the approval program by Ministry.

FIGURE 3

CERTIFICATES OF APPROVAL - ESTIMATED COSTS OF TREATMENT WORKS: JULY 1965 to DECEMBER 1973.

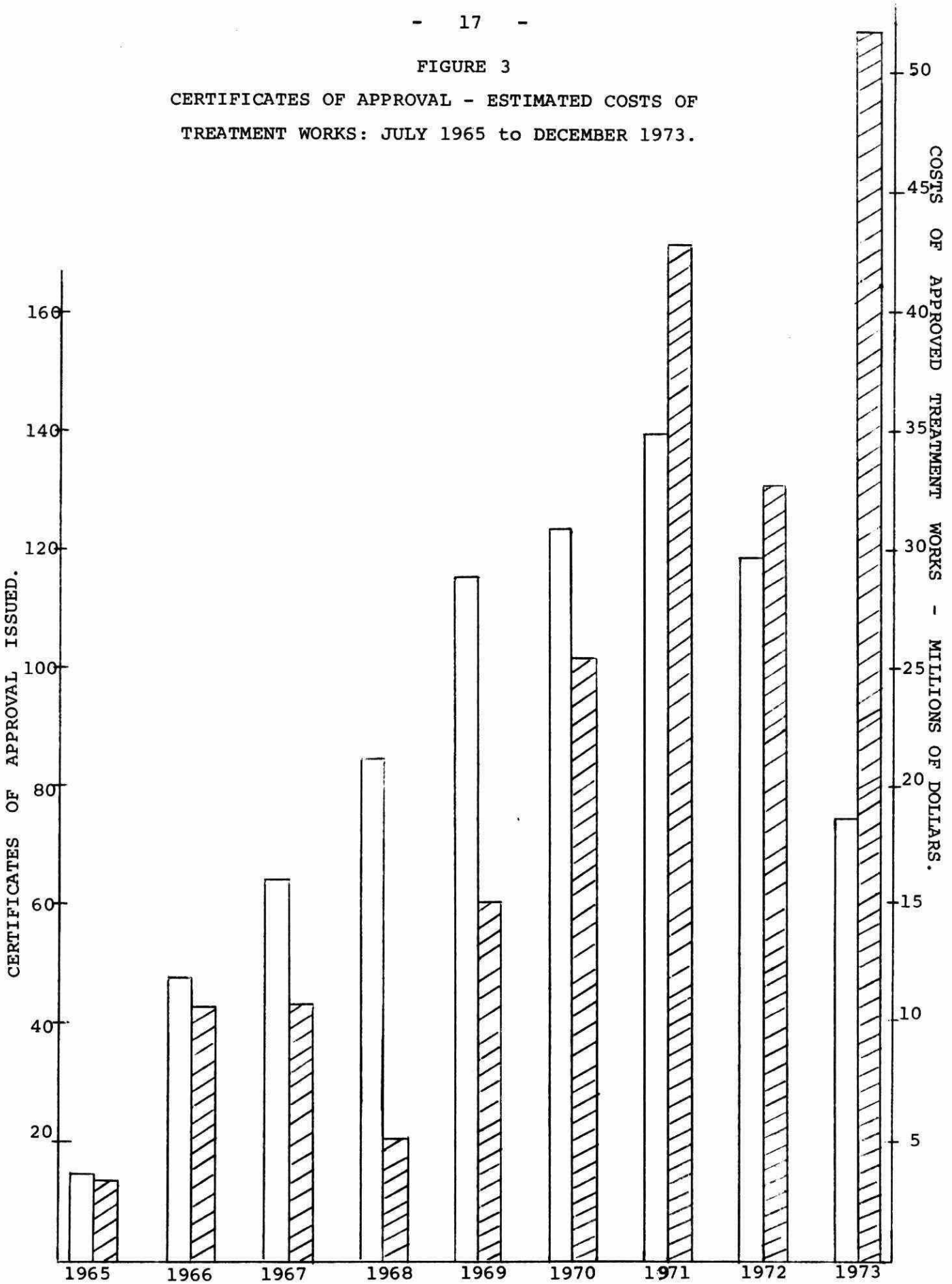
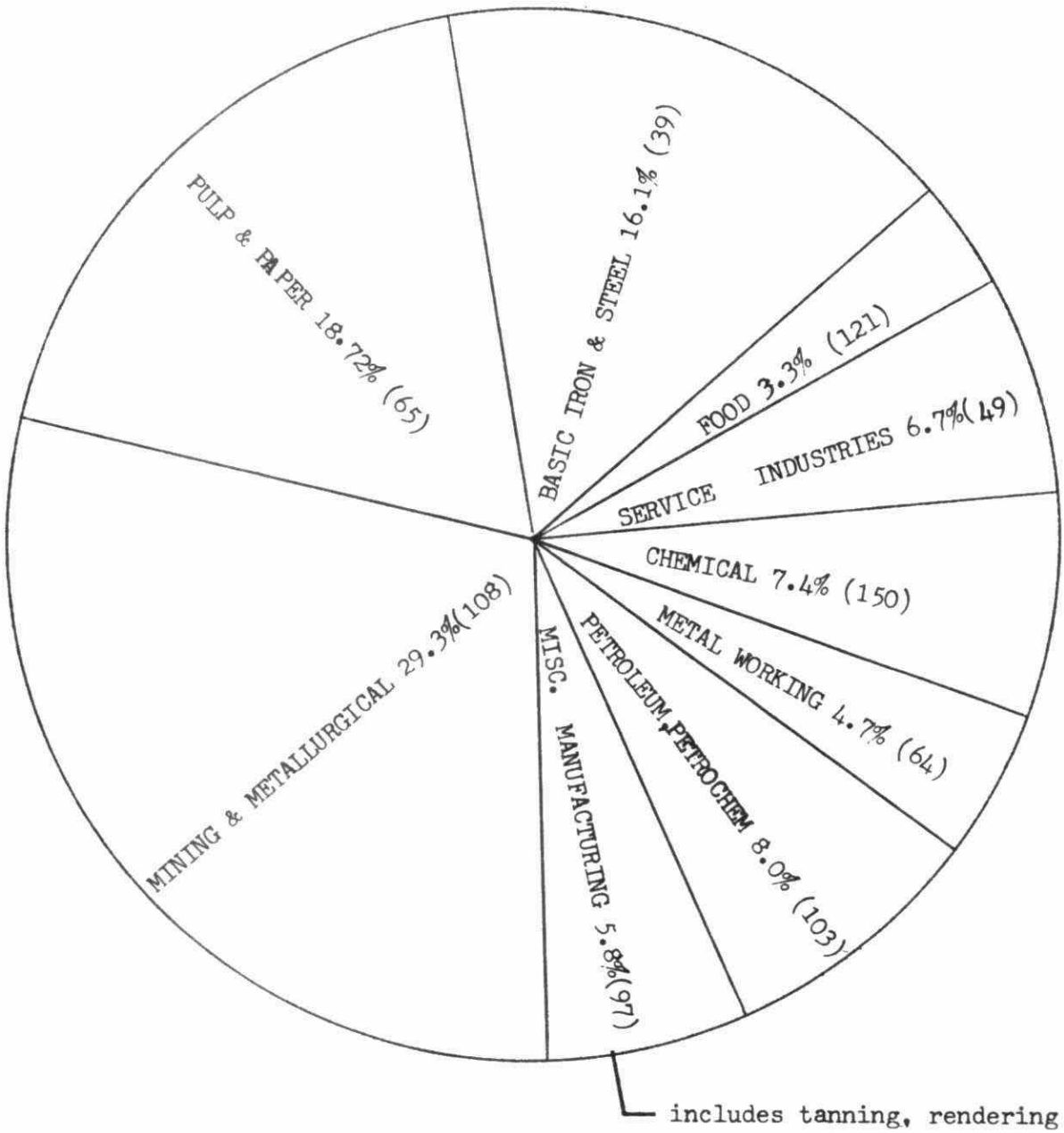


FIGURE 4

RELATIVE DISTRIBUTION OF ESTIMATED EXPENDITURES
APPROVED BY MINISTRY 1965 - 1973


BASIC IRON & STEEL 16.1% (39)
FOOD 3.3% (121)
SERVICE INDUSTRIES 6.7% (49)
CHEMICAL 7.4% (150)
METAL WORKING 4.7% (64)
PETROLEUM, PETROCHEM 8.0% (103)
MISC. MANUFACTURING 5.8% (97)
MINING & METALLURGICAL 29.3% (108)
PULP & PAPER 18.7% (65)
includes tanning, rendering & textiles.

(108) - INDICATES NUMBER OF CERTIFICATES APPROVED.

TABLE VII

PROJECTED COST ESTIMATES TO EFFECT POLLUTION CONTROL CONSISTENT WITH CURRENT MINISTRY OF THE ENVIRONMENT OBJECTIVES (1973) - MILLIONS OF DOLLARS

Drainage Basin	Pulp and Paper	Mining and Metallurgical	Basic Iron and Steel	Petroleum and Petrochemical	Chemicals	Food Processing	Metal Plating & Finishing	Miscellaneous Manufacturing	Service	Tanning and Rendering	Textiles	Total
Hudson Bay/ Arctic	39.331	4.9										44.231
Lake Superior	44.025	3.65				0.25	0.05		0.001			47.976
St. Mary's River/Lake Huron	12.08	16.55	5.0		0.15	0.071	0.1		0.2			34.151
St. Clair River/ Lake St. Clair/ Detroit River		0.01		22.05	7.735	0.03	0.255	0.01				30.09
Lake Erie		1.2			1.0	0.089	0.02			0.15	0.02	2.479
Niagara River			4.25									4.25
Lake Ontario	15.18	0.036	32.0		2.72	0.286	5.435	0.01	0.06	0.07		55.797
St. Lawrence River	0.5				0.67		0.04					1.21
Ottawa River	9.25	3.0		0.05				0.1			0.18	12.58
Total	120.366	29.346	41.25	22.1	12.275	0.726	5.9	0.12	0.261	0.22	0.2	232.764

NOTE: This table does not include cost of facilities under construction and/or formally approved at the end of 1973.

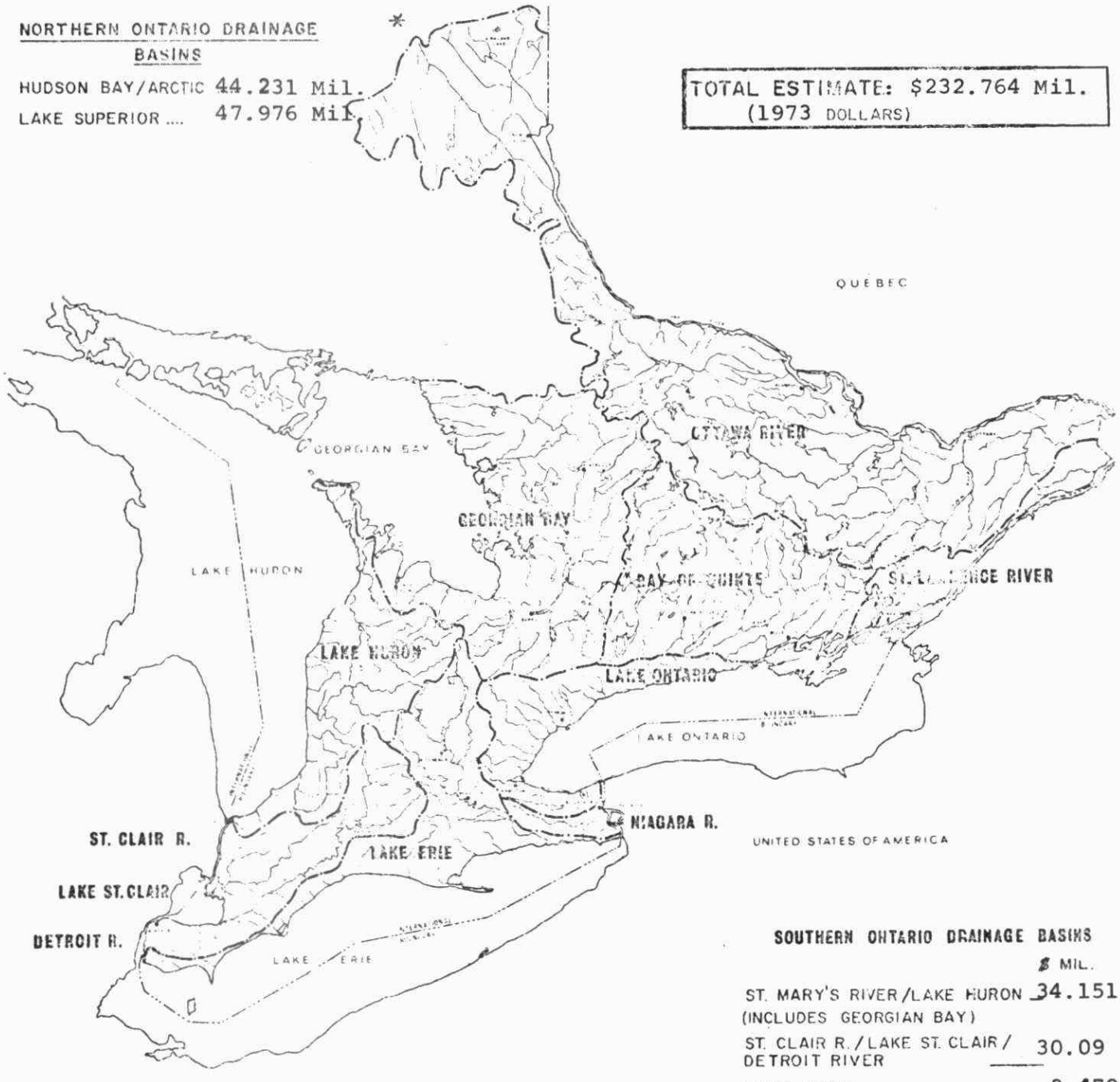
FIG.5

PROJECTED COST ESTIMATES ON DRAINAGE BASIN BASIS TO ABATE EXISTING INDUSTRIAL POLLUTION

NORTHERN ONTARIO DRAINAGE BASINS

HUDSON BAY/ARCTIC 44.231 Mil.
LAKE SUPERIOR .... 47.976 Mil.

TOTAL ESTIMATE: $232.764 Mil.
(1973 DOLLARS)



SOUTHERN ONTARIO DRAINAGE BASINS

	$ MIL.
ST. MARY'S RIVER/LAKE HURON (INCLUDES GEORGIAN BAY)	34.151
ST. CLAIR R./LAKE ST. CLAIR/ DETROIT RIVER	30.09
LAKE ERIE	2.479
NIAGARA RIVER	4.25
LAKE ONTARIO (INCLUDES BAY OF QUINTE)	55.797
ST. LAWRENCE RIVER	1.21
OTTAWA RIVER	12.58

* - NORTHERN ONTARIO DRAINAGE BASIN NOT SHOWN ON THIS MAP.

FIGURE 6

PROSECUTIONS & ORDERS: 1965 to 1973

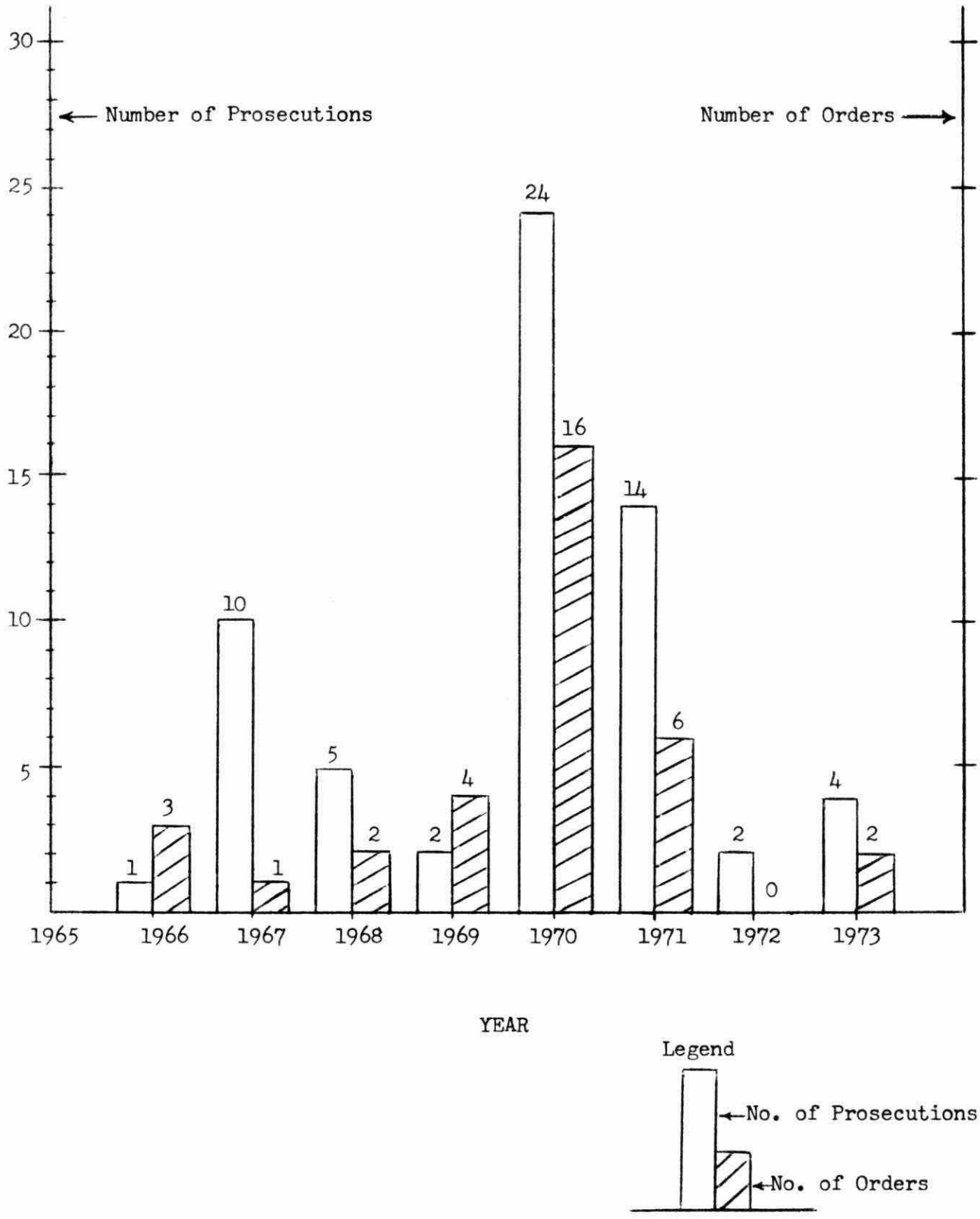


TABLE VIII

SUMMARY OF LEGAL ACTIVITIES BY THE INDUSTRIAL WASTES BRANCH AGAINST INDUSTRIES*: 1965-1973

I

Year	Companies Prosecuted	Orders	Public Hearings
1965	0	0	0
1966	1	3	1
1967	10	1	1
1968	5	2	7
1969	2	4	6
1970	24	16	3
1971	14	6	4
1972	2	0	1
1973	4	2	0
TOTAL	62	34	23
TOTAL CHARGES	107		
TOTAL CONVICTIONS	81		
TOTAL FINES	$31,955.00		
AVERAGE FINE/ CONVICTION	$ 394.51		

II

Industrial Classes	Companies Prosecuted	Orders	Fine in Dollars
Basic Iron and Steel	-	-	-
Chemicals	3	7	1,800
Food Processing	20	1	7,750
Metal Plating and Finishing	13	8	5,305
Mining & Metallurgical	3	4	2,900
Petroleum and Petrochemical	-	-	-
Tanning & Rendering	1	-	50
Pulp and Paper	8	12	9,250
Service	14	2	4,900
Miscellaneous Manufacturing	-	-	-
Textiles	-	-	-
Total (1965-1973)	62	34	$31,955

*Does not include legal action against industry taken by private citizens or public groups.

TABLE IX

UNUSUAL DISCHARGES OF MATERIALS RECORDED IN 1973

Number of Spills	696
Number of Complaints	182
Total Number of Incidents Reported	878
Number of off-hours reports to the MOE (included above)	120
Nature of Material Lost During Spills	
(i) Petroleum Products	
Number of Incidents	507[1]
Volume of Loss Reported (1,000 gals)	611
Number of Incidents - Loss Unknown	231
(ii) Non-Oil Spill	
Total Incidents Reported	189[2]
Number of Industrial Upsets	133
Total Number of Spills	696[3]
Causes of Spills	
Equipment Failure	210
Negligence	167
Traffic Accident	88
Others and Undetermined	231
Total	696

1+2 = 3

(i) Acid Mine Drainage

1971

The phenomenon of acidic conditions which develop in tailings areas and downstream waters due to base metal operations involving high sulphide ores is now well known. The Serpent River watershed is a classic example of this type of pollution caused by inadequate waste treatment practices by the uranium mining industry over a decade ago. The acid mine drainage problem was well documented late in the year by staff in a comprehensive report entitled "The Problem of Acid Mine Drainage in the Province of Ontario" and is now available to the mining industry and to the public. In general, by the end of 1971, acid mine drainage problems in the Province were slowly coming under control and substantial acid abatement programs in critical areas had been initiated.

During the last couple of years, staff found it necessary to actively encourage the mining industry to reduce the amounts of water required for processing ores. The beneficial effect of such a water-use minimization program is a reduction in all waste flows which lessens the practical, technical and economic burdens of acid waste treatment. The wastewater recycle program involved was, and continues to be, a success.

New emphasis was placed on the chemical treatment of mine waste flows from both active and abandoned operations. Several new acid waste treatment plants were installed by the mining industry. Also, all new mining operations coming into production are now subject to strict environmental controls. Major acid mine drainage problems should therefore not be experienced at any of the new operations.

1973

Major acid mine drainage problems existed at 9 active and 6 abandoned sulphide-ore properties. In all cases, the wastewater discharges from these properties do not comply with the mining guidelines of the Ministry. In each case, the Ministry had initiated a program of acid abatement but a lack of suitable technology did not permit a complete solution at any one property. The Ministry will continue to work closely with the companies involved to effect solutions to these problems as soon as possible.

(ii) Stabilization of Tailings Piles

1971

As a result of recommendations and much work by the Division of Industrial Wastes, legislation was incorporated in 1970 into The Mining Act (Section 168-(1)) regarding the stabilization and rehabilitation of tailings areas. It is now the legal responsibility of the mine manager "to plant and maintain vegetation, or otherwise stabilize the tailings areas which will not be required for future impoundment of tailings to the satisfaction of the district engineer of mines". In addition, the amended legislation requires that "a bond or security deposit in an amount deemed necessary by the chief engineer of mines to complete the rehabilitation--shall be deposited with the Department of Mines". Thus, the stabilization and rehabilitation of tailings areas is now an integral part of a pollution control program by a new mine-mill complex from the start-up of operations.

While some revegetation has been successfully effected by The International Nickel Company of Canada, Limited in Sudbury and Hollinger Mines Limited at Timmins, problems of maintaining plant growth have been encountered wherever strongly acidic conditions exist. Several mining companies have observed effects similar to those encountered in arid areas where irrigation is extensively employed, namely, salts tend to migrate to the surface and kill the young plants. Mulching to reduce evaporation has extended the life of the plants, and underdraining to carry away concentrated solutions has been investigated.

In the gold mining and other areas where sulphides do not occur to any great extent, tailings dykes and piles are supporting the growth of both grasses and trees.

1973

Since the previous Status Report was written (1971), jurisdiction for revegetation and/or stabilization was transferred from the Ministry of the Environment to the Mines Branch of the Ministry of Natural Resources. The Ministry of Natural Resources now operates all Provincial stabilization programs utilizing its own field staff.

The Ministry of the Environment maintains a direct interest in the subject but does not have any formal input to program development in the areas of research or surveillance.

(iii) Industrial Accidents and Spills

1971

Spills of hazardous materials to watercourses continue to be a significant pollution factor. Amendments to OWRC legislation in 1970 now make it mandatory for unusual discharges of materials to be reported forthwith to the Commission (Section 32-(3), R.S.O. 1970). Failure to do so can result in a $5,000 fine. Also, Section 34(1), R.S.O. 1970 gives the Commission the power to order "any municipality or industrial or commercial enterprise to have on hand and available at all times such equipment, chemicals and other materials as the order specifies to alleviate the effects of any impairment of the quality of water that may be caused by the municipality or industrial or commercial enterprise". Failure to comply with the order can result in a fine of $500 maximum.

As a result of the new legislation, 285 spills were reported in 1971 to the OWRC, of which 19 were of major proportions. The loss of 600 tons of concentrated sulphuric acid to the Pickerel River due to a train derailment was one such accident. Causes of spills were due to a variety of factors including equipment failure, negligence on the part of operators and faulty maintenance. Sixty percent of all spills involved the loss of oil or other petroleum products. Only 17 percent of all spills could be classed as "true" accidents.

For a number of years, staff of the Division have been stressing the concept of prevention of spills to industrial officials and the philosophy is beginning to achieve results. Some companies have embarked upon Spill-Incident-Prevention programs and have forwarded formal reports to the Division for analysis. In general, it can be said that industry is much more aware of the potential for spills in processes and equipment, however, much needs to be done to improve this aspect of pollution control.

A major achievement in 1970 was the development and publication of the Interim Province of Ontario Contingency Plan for spills of oil and other hazardous materials. This Plan was designed to be compatible with the Federal and International Contingency Plan in the Great Lakes basin and with local co-operative contingency plans throughout the remainder of the Province.

A spill response centre, called the Ontario Operations Centre (OOC), has been established within the Ministry for the purpose of receiving spill reports on a 24-hour basis and initiating quick and effective response action. In the event a major spill is reported, the OOC would implement the Ontario Contingency Plan.

Under the Contingency Plan, Regional Operations Teams (ROTs) are being formed for the purpose of guiding the response to major spills within any given region in the Province. The ROT will serve as the "technical team on the scene" of any major spill which may affect watercourses.

In addition, the Canadian Chemical Producers Association and the Petroleum Association for Conservation of the Canadian Environment are developing contingency plans for dealing with moderate spills of hazardous materials and petroleum products during transport. It is hoped that this trend will continue and industry groups continue to develop local and area contingency plans for dealing with products manufactured by, or being transported for, them.

1973

Spills of hazardous substances continued to represent a significant contributing factor to the overall pollution load in Ontario. Since 1971, the total number of spill incidents reported to the Ministry has increased dramatically to just over 500 for the year 1972 and to approximately 700 during 1973. In addition, approximately 180 complaints were received in 1973.

Eleven of the spills during 1973 were classified as major incidents and included three oil pipeline ruptures, accounting for the loss of 80,000 gallons of light oils, and one train derailment which resulted in the loss of 60,000 gallons of bunker oil and 60 tons of caustic soda. During 1972, two major incidents of note were the collision of two ships in the St. Clair River, resulting in the sinking of one of the ships with a loss of 4,000-6,000 gallons of fuel oils, and a train derailment near the City of Welland in which approximately 1,500 tons of concentrated sulphuric acid were spilled.

During 1973, 507 incidents were reported which involved the loss of petroleum products. Available information indicated the loss of 576,000 gallons of products from only 275 of these incidents. Of the total number of spills reported in the Province in 1973, equipment failure and negligence may be singled out as the main causes. Traffic accidents have increased also and it is readily apparent that a much greater effort must be devoted to spill prevention. Similar findings and conclusions have been made by other provincial, state and federal agencies both in Canada and the U.S.A.

Considerable progress has been made in the area of contingency planning at all levels of government. A joint Canada-U.S. Plan was finalized and as part of this Plan, the Ontario Ministry of the Environment has accepted major roles and responsibilities in incidents affecting Ontario. With reference to the Province of Ontario Plan, a status report was published during 1973 which summarized and updated the 1971 Interim Plan and advocated major changes in some of the concepts contained in the Interim Plan.

Since the publication of the 1971 Interim Plan, two Regional Response Teams have been established under the Plan. These are the Lambton County and the Ottawa-Carleton Regional Response Teams.

Encouraged by the Ministry, the engineering or works departments of several larger municipalities have prepared or initiated steps to prepare municipal contingency plans. Such plans are necessary to fill the wide gap which often exists between the plans of industry and the Provincial Contingency Plan.

Industry contingency plans have become more numerous and refined. Outstanding examples are the plans prepared by the Hamilton Harbour Spill Group (cooperative), the Petroleum Association of Ontario, several of the major oil companies individually, and the Canadian Chemical Producers Association. Industry is becoming more aware of its responsibilities to initiate quick and effective action in the event of a major spill incident.

When the parties involved in spill incidents failed to respond to Ministry directives to clean up, the Ministry undertook the clean-up in two cases by hiring contractors to perform the necessary work. In one of these cases, the Ministry was able to recover the costs when the responsibility of the spill was finally established.

(iv) Disposal of Concentrated Liquid Wastes

1971

Little progress has been made in the area of disposal of concentrated liquid industrial wastes. Such wastes are still being disposed of in a number of selected landfill sites and by subsurface methods (wells) into the Detroit formation. As a result of regulations under the Waste Management Act (now The Environmental Protection Act), better control is exercised in the disposal of materials such as spent plating solutions, oily materials, waste acids and industrial cleaning solutions at landfill sites. However, the closure of one of the larger land disposal sites in the Metro Toronto area at Stouffville in 1970 precipitated a crisis which clearly showed the need for alternative and more sophisticated methods of disposal. It was suggested in the 1968 Status Report that central treatment facilities to handle complex industrial wastes were required. The Provincial Government has been trying to encourage private enterprise to build such a facility in Mississauga for over 2 years but up to the time of writing this report, despite much interest on the part of several companies, construction has not started.

In the meantime, great uncertainty prevails over the fate of the many complex and toxic chemical residues produced by industries in the metropolitan areas. It would appear that, since negotiations to date with private enterprise have failed to get concrete action, the Government might well have to get into the business itself. Perhaps, this is not a desirable approach, however, the need for such facilities is obvious and a Government-owned and operated utility providing a necessary service may not be all that out of line, particularly when it is considered that the Government already offers associated services in the area of sewage treatment.

1973

In mid-1973, a waste treatment facility was constructed in the City of Mississauga by Goodfellow Enterprises (Sarnia) Limited to handle concentrated liquid wastes (sludges). The facilities comprise a variety of storage tanks and ponds together with a thermal disposal plant. Organic wastes such as oils, paints, solvents, etc., are being accepted for incineration. Large unit loads of inorganic wastes are accepted for subsequent disposal in the deep well facilities at Sarnia. However, acceptance of wastes of this kind is done strictly on an economic basis, with the added provision of Ministry approval.

A similar type of facility is operated by Interflow Systems Limited in the City of Hamilton. This plant is designed to incinerate liquid industrial wastes but does not have adequate air emission control equipment. Consequently, the nature and rate of waste materials processed is controlled by the limits placed on air emissions.

(v) *Taste and Odour Producing Materials from Kraft Pulping Operations*

1971

Research has been initiated into the origin of taste and odour producing materials and fish-flesh tainting potential from kraft pulping operations. Because of intense pressure brought to bear by staff, a study was undertaken by 'Domtar' at its Cornwall mill to identify the process waste streams responsible for taste, odour and fish-flesh tainting and to investigate methods for treatment of these noxious wastes. The study was subsequently funded by the Federal Government under the Water Pollution Abatement Research Program. Condensate waste streams from the digester and evaporator areas together with recovery furnace flue gas condensate were identified as the main contributors to odour and fish-flesh tainting.

There is good evidence to suggest that the treatment and disposal of these contaminants can be largely accomplished by in-plant methods rather than by facilities such as aerated lagoons which constitute the current practice for dealing with this particular pollution problem in North America. Segregation of condensates followed by stream stripping and incineration is being practised successfully at one installation in Sweden and Domtar is committed to installing a similar system at Cornwall in 1973. The success or failure of this system will determine the future approach to removing taste and odour compounds from kraft mill wastes in Ontario.

(vi) Control of Industrial Waste Discharges to Municipal Sewerage Systems

1971

The enactment and enforcement of sewer-use by-laws by municipalities to control the discharges of industrial wastes to sewer systems needs a better coordinated approach than is presently in existence.

In Ontario at present, there are 265 municipalities which have sewage treatment plants (STP). It is felt that at least 194 of these municipalities should enact a sewer-use by-law to regulate industrial discharges for treatment at the STP. One hundred and thirty-six municipalities have enacted some form of by-law and 66 of these have been requested by the OWRC to implement a by-law enforcement program but only 43 have done so. Currently, enforcement programs are being set up in an additional 21 municipalities. Thus, it is obvious that many municipalities can attract certain types of industry by neglecting to enact and enforce sewer-use by-laws to protect their sewage works, while at the same time settling for a poorer quality STP effluent to the local river or lake--in effect, creation of a so-called "pollution haven".

In addition, there are other problems associated with the control of industrial discharges to municipal sewerage systems. Municipalities which have signed agreements with the OWRC relating to financing and operating of sewage treatment plants have generally adopted a fairly uniform and consistent by-law in terms of allowable limits for specific pollutants. However, other municipalities have set higher or lower limits for varying reasons, some of them valid, and thus an industry may have to pretreat its wastes at considerable cost in one municipality to meet the by-law limits or else pay a surcharge fee, whereas the same type of plant in a neighbouring municipality may not have to bear these additional costs. For instance, industries in the plating and tanning business have recently complained at this apparent inequitable and inconsistent approach among municipalities and point to competitive disadvantages in this regard. Local elected representatives are concerned and would like to see such matters resolved.

It may be that legislation is required to have uniform sewer-use by-law limits placed on specific contaminants regardless of the municipality. This contentious matter requires greater attention and an imminent solution, otherwise, progress in this important aspect of pollution control can be slowed down. The question of the legality of special agreements between municipalities and industries should also be considered and resolved.

In 1969, a training course entitled "Control of Industrial Wastes in Municipalities" was started by the OWRC with the support of the City Engineers' Association. It was repeated in 1970 and 1971 and will continue to be given as long as there is a demand for it by those working in municipal control programs in Ontario.

1973

Control of industrial wastes in municipalities is an aspect of the water management program which continues to be of concern to the Ministry. Although no serious environmental problems have arisen from lack of control or insufficient control, uniformity of control would achieve three important results:

(a) elimination of the so-called "pollution havens"

(b) reduction of the quantity of materials being discharged into the environment from sewage treatment plants (both liquid and solid effluents)

(c) encouragement of the concept of re-use of materials rather than disposal

Achieving uniformity of control of industrial wastes throughout the Province is not a simple task for this Ministry. Municipalities are a creation of the Province and the Ministry of the Environment has no direct control over municipal regulation of sewer-use, except where a sewage works or the operation of a sewage works is impaired. Therefore, the Ministry has, of necessity, resorted to the use of persuasion which, although largely successful, has also been time consuming.

There are two basic requirements for satisfactory control of industrial wastes in municipalities:

(a) enactment by the municipality of a suitable sewer-use by-law

(b) institution by the municipality of a suitable by-law enforcement program

Presently, in Ontario there are 284 sewage works serving 247 municipalities and on file, there are 230 sewer-use by-laws which are acceptable. Of these by-laws approximately 17 relate to municipalities where the sewage works are in the planning or construction stages. On the other hand, there are 28 municipalities which have significant industrial discharges into the sewage works but which do not have an acceptable by-law. These 28 municipalities will constitute an on-going program for the Ministry in the future. It should be noted that only 48 municipalities have a sampling program and upgrading in this area will be required. This accounts for a high proportion of the unsatisfactory programs amongst those municipalities which do have programs. Of the remaining municipalities which have sewage works but no enforcement program or by-law, the majority have no significant industry (or no industry at all) and, therefore, do not require a by-law or program.

With respect to the two basic requirements for control of industrial wastes, it is clear that further work is required, especially in the area of sampling programs.

The Ministry has recognized that both the terms of by-laws and the enforcement of by-laws across the Province are inconsistent and even inequitable. In the case of discharges of "heavy" metals, a program was undertaken to bring uniformity at least to the regulations respecting heavy metals and, if possible, to the enforcement of the provisions of by-laws. However, the Ministry has no legal basis to require consistent and equitable by-laws and enforcement programs and consideration is being given to suitable amendments of existing legislation. A major part of this program was the institution of a committee composed of municipal and Ministry representatives to study revision of the Ministry's "Model Sewer-Use By-Law". The involvement of pollution control staff from both large and small municipalities ensured that any new recommendations would have Province-wide application with respect to the regulation of discharges of non-degradable, non-assimilable materials (such as heavy metals). There still remains, however, the question of applying uniform, across-the-Province enforcement.

Legal staff of the Ministry are of the opinion that special agreements between industries and municipalities have no legal basis under The Municipal Act. The Committee has recommended that the Ministry of Treasury, Economics and Intergovernmental Affairs be approached to see if the necessary amendments to The Municipal Act can be made so that municipalities will be able to enter into legal agreements with industry.

(vii) Location of New Industry

1971

Mechanisms are being developed for assessing the potential impact on the environment at sites where new industry would like to locate. For example, for future thermal power generating stations, Ontario Hydro is now being requested to engage in environmental impact studies on proposed sites and to submit these studies for analysis by staff, many years in advance of committing the site for construction. In the period 1969-1970, when a major pulp and paper industry was considering the feasibility of building a new kraft mill complex in the Haliburton region with discharge of treated wastes to the Madawaska River, it was clearly shown by Division staff that such a development would be entirely incompatible with the existing and future recreational uses of the region. As a result, the company proposed that the pulp mill be relocated on the shores of Lake Ontario with the debarking and chipping operations remaining at the centre of the wood resource near Bancroft. The project was finally abandoned but illustrated the type of analysis of sites for new industry being carried out in terms of the total potential environmental impact.

On another front, excellent liaison has been established with the Ontario Department of Trade and Industry. Whenever new industry plans to locate in Ontario, as a result of efforts by that Department, the OWRC is involved in the initial discussions with company personnel to offer advice and assistance on selection of potential new sites. Where it is appropriate, the suitability of industrial wastes for treatment at municipal sewage treatment plants is discussed, which often is a significant factor in final site selection.

Pre-operational baseline environmental studies are also being requested of major industrial complexes as a routine procedure, where concern for the effects on the aquatic environment exists. For example, such in-depth baseline studies are being done in northwestern Ontario in the Lake Shebandowan area by The International Nickel Company of Canada, Limited before the mine-mill complex comes into production. These studies generally continue upwards of two years and are to be continued long after the industrial operations are started. Similar studies are being done off Nanticoke in Lake Erie through a committee comprising of representatives from several government departments, Ontario Hydro, The Steel Company of Canada, Limited and Texaco Canada Limited.

An interdepartmental Task Force on Generation Station Siting has been formed with OWRC representation. One factor of concern is that public input is not solicited or assessed in the decision-making process. As controversial and time-consuming as it might appear, this public input appears to be necessary. This is becoming evident particularly in those instances where plants are being built under the regulatory and controlling auspices of the Federal authorities such as the Atomic Energy Control Board. Such installations include nuclear power plants and the Bruce Heavy Water Plant, and better mechanisms for site selection are required if major environmental use conflicts are to be avoided.

1973

Legislation is being considered that will make it compulsory for proponents of major industrial projects that will have a significant potential impact on the natural environment to document this impact in a formal submission to government. On an information basis, all thermal power generating stations Ontario Hydro is now developing are preceded by an environmental assessment study and these studies are submitted for analysis to MOE and other Ministries for review in advance of committing the site for construction. In the future, where developments are clearly shown to be incompatible with legitimate existing and future uses of an area they would have to seek an alternate location. Some projects may have to be abandoned altogether based on their total negative potential environmental impact.

On another front, good liaison continues to exist with the Ontario Ministry of Industry and Tourism, and whenever new industry plans to locate in Ontario, as a result of efforts by that Ministry, MOE is involved in the initial discussions with company personnel to offer advice and assistance on selection of potential new sites. Where it is appropriate, the suitability of industrial wastes for treatment at municipal sewage treatment plants is discussed, and this liaison continues to be a significant factor in final site selection of many industries in urban areas.

Pre-operational baseline environmental studies continue to be requested of major industrial complexes as a routine procedure, where concern for the effects on the environment exists. These studies generally continue upwards of two years, and have to be continued for some period after the industrial operations commence to document the impact. Studies of this nature will be done at least up until 1977 off Nanticoke in Lake Erie through a committee comprising of representatives from several government departments, Ontario Hydro, The Steel Company of Canada, Limited and Texaco Canada Limited.

The need for a continuing interdepartmental Task Force on Siting of new industry is under consideration. One factor of concern is that public input on nearly all major projects underway or planned on the private sector is still not solicited or assessed in the decision-making process. As controversial and time-consuming as it might appear, this public input appears to be necessary in 1974. This is becoming evident particularly in those instances where plants are being built under the regulatory and controlling auspices of the Federal authorities such as the Atomic Energy Control Board or where substantial DREE funds are involved. Such installations include nuclear power plants and the Bruce Heavy Water Plant, and resource-based industries in the North. Better mechanisms for site selections are required if major environmental use conflicts are to be avoided.

(viii) Effluent and Water Quality Control Objectives

1971

In June 1970, the Water Quality Objectives Committee finalized its report "Guidelines and Criteria for Water Quality Management in Ontario" which was accepted by the Commission. The reports suggests a broad framework for drainage basin management of water resources, outlines policy guidelines for such management and lists criteria for a variety of water uses. Many of the concepts outlined in the report are being used by technical staff within the OWRC in river basin studies, however, the details of the framework have not been developed sufficiently and the mechanisms for implementing such aspects as water quality standards, public hearings and effluent requirements have not yet been formalized. The approach is still tentative, exploratory and of questionable legal status as for example, the matter of effluent permits. As a result, the concern expressed in 1968 still prevails in that drainage basin management of water resources in Ontario is not being effected in an optimized manner.

On another front, the technical expertise of staff and their experience in the practical aspects of industrial waste pollution control have been made available to the Federal Department of the Environment in the development of national regulations for broad industrial classifications. To date, considerable advice and help has been given in the pulp and paper, chlor-alkali, mining, fish processing and oil refining areas.

Because mining activities in Ontario have caused water pollution problems of major proportions, much time has been devoted to upgrading Provincial guidelines for waste control in that industry. These guidelines should be completed in 1972.

1973

The report, "Guidelines and Criteria for Water Quality Management in Ontario" continues to serve as a basis for the Ministry's activities in water management. The mechanisms for implementing the concepts of water quality standards, effluent requirements and public hearings have not yet been formalized. Some exploratory work has been completed on the matter of effluent permits but a major policy decision is still required of the Ministry before such a system will be implemented.

The pending reorganization of the Ministry has tended to slow down activity in these areas but it is anticipated that the activity will increase with strong regionalization and technical support under the reorganized structure.

There has been some progress in the approach to river basin management. The formation of the Grand River Implementation Committee, a Committee comprised of various municipal and government agencies with direct interests in the Grand River, is a major step towards true drainage basin management of this river system.

After much delay, the development of guidelines for effluent control in the mining industry was completed. At the end of 1973, a document entitled, "Effluent Guidelines and Receiving Water Quality Objectives for the Mining Industry in Ontario" was issued. These guidelines are expected to form the basis of future Ministry mine waste control programs with additional requirements being developed as dictated by localized conditions, technology changes, etc.

Similar guidelines for the "Metal Plating Industry", and "Sawmills, Veneer Plants, Board Plants and Plywood Mills" are under development and are expected to be issued shortly.

Under the reorganized structure of the Ministry, the newly-created "Pollution Control Branch" will be charged with the task of developing effluent emission guidelines, standards, objectives, etc., for all industrial operations.

(ix) Economic Considerations

1971

Financial incentives to industry to help in the battle against pollution have been instituted and are being considered further at both the Federal and Provincial levels of government. With the passage of the 'national' regulations for the pulp and paper industry by Ottawa and from experience with the costs required to "clean-up" the existing pollution on the Ottawa River, it is clear that unless financial aid is forthcoming, the national regulations cannot be strictly imposed without causing great social and financial hardships to the industries and communities alike.

The Division has worked extensively at preparing a financial brief exploring a number of alternatives but primarily on low-cost interest loans to industry. This report is being studied by the Provincial Government. It is admittedly a short-term expedient to provide some impetus for continuing progress in pollution control through difficult economic times, recognizing that the ills of many industries including the pulp and paper industry are much more complex and fundamental which will require major decisions and changes (such as rationalization) if survival in Ontario and Eastern Canada is to be accomplished.

In 1970, the Ontario Development Corporation introduced a capital loan program for pollution control works for industry. The maximum amount of the loan, if ODC requirements are satisfied, is $250,000 which is really geared towards helping smaller industry with its pollution problems. The ODC loans are at current rates of interest (about 8 percent at the end of 1971), are not large enough for major treatment works and are not considered to be much of an incentive by industry. In 1971, Ontario also introduced a grant system for pollution control equipment which is in reality a rebate on the 5 percent Provincial sales tax. The straight-line capital depreciation over 2 years allowed by the Federal Government on treatment works is to expire at the end of 1972.

In summary, if some reasonable progress in pollution control is to be achieved in these inflationary times of high unemployment and apparently conflicting priorities for limited supplies of available capital funds, then it is believed that some direction and help will have to be given by governments to ease the social evil of environmental degradation. Punitive sanctions and the passing of even more stringent legislation will not provide the needed solutions to many problems.

1973

The need for financial incentives to industry to help in the battle against pollution continues to be studied. The true situation is still far from clear although it does appear that most industries will be capable of financing the necessary pollution controls providing the costs can be spread over a 'reasonable' time frame. The exception continues to be the pulp and paper industry.

During 1973, the Ministry added two social-economists to the staff of its Strategic Planning Branch. A study into the financial status and implications of pollution control requirements of the pulp and paper industry in Ontario has been undertaken and is expected to be complete by mid-1974. The results of this study should provide the Ministry with a sound basis for formulating future pollution abatement policies for this industry.

Since 1970, recommendations for grants under The Pollution Abatement Incentive Act, 1970 have totalled approximately $1.25 million. This Act effectively rebates Ontario sales tax paid on equipment which is to be used for pollution control.

The straight-line capital depreciation over 2 years allowed by the Federal Government on treatment works was extended through 1973.

(x) *Performance of Consultants, Equipment Suppliers and Contractors*

1971

The techn ical capability of consultants has improved over the past few years to deal with pollution problems, nevertheless, there is still considerable room for improvement. One major concept which needs to be more deeply engrained in industry and consultants is to do less thinking in terms of 'wastes' and to develop methods for the recovery, recycling and re-use of such wastes or their by-products in profitable ways. Too often is a consultant hired to design systems for treating wastes in a non-productive sense when fundamental changes in philosophy could reap better rewards.

The introduction of requiring guarantees on equipment performance by industry and the evaluation reports on new treatment works required by the Division have helped considerably in designers and suppliers specifying and providing the right type of waste treatment equipment.

1973

The technical capability of consultants and equipment suppliers in designing, and recommending suitable operating and maintenance procedures for waste treatment works serving various industries in the Province continues to improve. To assure the proper operation of treatment works, the Ministry requires industry to submit performance evaluation reports and, in turn, industries have sometimes found it appropriate to include this item as part of their turn-key contracts with the consulting industry.

The Ministry continues to stress to industry and its consultants the importance of recovery processes in reducing waste loadings and the proper operation of treatment systems built to handle residual waste streams.

(xi) Nutrients

1971

Phosphorus in industrial discharges constitutes a very small percentage of the total loadings into Ontario's waters. All significant industrial sources have undertaken treatment programs. Reduction of nitrogenous wastes continue to pose problems, but at least one successful study in Ontario on nitrogen removal from wastes by biological methods has been completed. In-plant control and recovery of materials continue to be practised as the prime method for reducing nitrogenous compounds lost to watercourses. Based on available data, eutrophication of lakes in Ontario from phosphorus and nitrogen additions due to industrial discharges appear to be less of a problem than may have been postulated previously.

1973

Following successful completion of pilot plant studies on nitrogen removal by biological methods, a full-scale $2.5 million biological waste treatment system has been installed by a large chemical company in southeastern Ontario. The system has been designed to remove both organics and nitrogen and is now in the process of being started-up.

Ion exchange is being used successfully to remove ammonia from waste streams at a large ammonia production facility. Regeneration wastes are being re-used in the manufacturing processes. The process is extremely efficient with ammonia removals from the 1,000 mg/l level down to the 1 mg/l level being consistently achieved.

The discharges of ammonia at two steel mills have been drastically reduced by the implementation of new coke oven technology and the installation of ammonia recovery plants. A third steel mill is in the process of installing similar equipment.

Ammonia stripping is being practised at all Ontario oil refineries and residual levels of ammonia in the refinery effluents do not constitute a nutrient problem.

Certain ore milling processes use ammonia, a portion of which is discharged with the tailings. Maximum re-use of tailings pond decant is being practised but treatment of the final discharges is required. Solutions to these problems are being investigated.

(xii) Dissolved Hydrocarbons

1971

Progress has been made in defining the types and quantities of dissolved hydrocarbons in discharges from some of the petroleum and chemical industries. One major study in the Sarnia area has been completed on the effects of petrochemical wastes in terms of bioassays, taste and odour measurements in water, and fish-flesh tainting. Where reductions of dissolved hydrocarbons in effluents have occurred, this has been achieved primarily by in-plant control practices. Much more research needs to be done to define the characteristics of dissolved hydrocarbons in specific waste streams, their effects on the aquatic environment and to develop suitable methods for removing and treating these materials. Further studies are planned by the OWRC with the cooperation of the oil refining industries.

1973

Progress is being made in the abatement of dissolved hydrocarbon losses, particularly in the oil refining and organic chemical processing industries. Programs are being instituted by major petroleum and petrochemical plants directed specifically at reduction of dissolved hydrocarbons. Technology such as bio-oxidation, activated carbon adsorption, solvent extraction and concentration by evaporation, have been applied to this problem.

Federal guidelines and regulations for the petroleum refining industry imply, to some degree, control of dissolved hydrocarbons, particularly phenolics. The Ministry will superimpose more stringent regulations where necessary to protect receiving waters and promote maximum beneficial use of these waters. The application of technology to alleviate effects such as acute toxicity, fish flesh tainting and taste and odour attributable to dissolved hydrocarbons will form the basis of the Ministry's future programs.

Current abatement programs continue to emphasize gross removal of dissolved organics which have not been characterized as to specific adverse effects. More research is clearly necessary to define the exact nature and effects of specific component dissolved organics.

(xiii) Dissolved Salts

1971

Reduction of high levels of dissolved solids in certain types of industrial discharges continues to be a challenge to industry and regulatory authorities. Limited markets for certain by-products such as calcium chloride and vanillin still prevail. Separation and concentration techniques such as reverse osmosis have been improved but such processes are only installed where the need is fully justified. In Lake Erie, the IJC has set a water quality objective of 200 ppm maximum for dissolved solids. The OWRC has worked steadily with those industries with high salt discharges, such as the soda ash manufacturers, on programs of recycle and minimization of in-plant material losses. In northern Ontario, re-use and recycling of mine water and treated mill process wastes from tailings areas have been strongly advocated by OWRC, wherever possible, and many mine-mill complexes have gone, or are going, to varying degrees of recycle.

In the interim, not much more can be done. However, in order to hold against increases in concentrations of dissolved solids in the Great Lakes system, some thoughts should be given on siting of those industries which are the chief contributors. Perhaps, expansions or new plants should not be permitted on the Great Lakes and particularly in the Lake Erie Drainage Basin.

1973

Acceptable disposal of large quantities of waste dissolved solids produced by industry, in particular the chemical industry, continues to present a challenge to both regulatory authorities and industry. In some cases, it is possible to recycle such materials and industry is being encouraged to do this wherever possible. For example, depleted brines from the manufacture of caustic soda and chlorine and the production of ethylene glycol can be re-used to make up fresh brine feed solutions thereby eliminating waste discharges containing about 15 percent sodium chloride.

Utilization of by-product calcium chloride from soda ash production is expanding with a corresponding reduction in waste loadings to the receiving waters.

In the mining industry, dissolved salts are generated through neutralization of acid waters. However, the use of lime as the neutralizing agent(producing calcium sulphate which has limited solubility)and the recycle of water from tailings impoundments,tends to minimize the loadings of salts to receiving waters. Total or partial recycle of wastewater is being carried on at many locations.

In the pulp and paper industry, the first chemical recovery system to treat waste spent sulphite pulping liquors was started-up late in 1973. When certain start-up problems have been resolved, the plant is expected to recover a significant tonnage of 'salt cake' for sale to kraft pulp mills with a corresponding drop in dissolved solids in the mill discharges.

Because of the objective of 200 ppm maximum dissolved solids established by the IJC for Lakes Erie and Ontario and the St. Lawrence River and impending water quality standards for the Upper Great Lakes, the expansion of certain plants and the siting of new plants will have to be predicated on their contributions of dissolved solids. It may be necessary to direct certain industries to locate in alternative areas.

(xiv) Thermal Effects

1971

At the instigation of staff, much work has been accomplished in the last three years by Ontario Hydro on thermal studies at existing stations. The effects of heat on algae (cladophora) in terms of growth periods and abundance have been studied at the Lakeview Generating Station. Measurements have also been done on the thermal plume at this station which has led to the development of a crude mathematical model to predict the dispersion of the condenser cooling water plume at new sites. Baseline data on the aquatic environment continue to be collected and assessed at several locations such as Nanticoke, Lennox and Pickering. The Nanticoke Environment Committee was the first of its kind in Ontario and is an industry-government group studying many aspects of potential effects of future industrial activity, including heat losses, on a fishery. Guidelines for formal water quality studies have been drawn up by Hy dro at the request of OWRC for new sites for thermal generating stations, primarily because thermal effects can still only be speculated upon. In summary, thermal effects on the aquatic environment from large heat sources such as Ontario Hydro are actively being studied and will be for very many years to come.

1973

Thermal effects on the aquatic environment from large heat sources such as Ontario Hydro continue to be actively studied. Baseline data on the aquatic environment are being collected at several locations such as Nanticoke, Lennox and Pickering.

A Pre-Operational Report on Nanticoke was issued in 1973. This report documents the conditions in the aquatic environment in Long Point Bay in Lake Erie from 1967-1971, prior to start-up of the Nanticoke Generating Station and the Stelco and Texaco development.

The magnitude of the future generation program of Hydro has created concern that the use of once-through cooling, with the resulting thermal discharges, may contribute to adverse effects in the Lake Ontario eco-system in the future. To ensure that adequate data are available upon which decisions relating to cooling water use can be based, a task force has been established to determine the scope of studies necessary. Until such time as the results of proposed studies are available, decision will, of necessity, be based on a site by site evaluation using existing data. In addition, a short-term study into alternative methods of once-through cooling will be conducted in 1974.

Concerns relating to electrical energy generation are no longer limited to thermal effects. Added factors such as the entrainment of fish and aquatic organisms in cooling water intakes and the effects of the siting of a generating station on the local total environment are now requiring much more study. In future, therefore, discussions on Thermal Effects should be included in a new section, 'Electrical Energy'.

(xv) Subsurface Disposal

1971

Subsurface disposal of wastes has come under increasing scrutiny in the past few years. This method of disposal is presently confined to the Detroit River geological formation in southwestern Ontario and is used by many chemical industries in the Sarnia area. However, evidence has suggested that disposal of wastes to this shallow formation is likely to cause problems in the future. The Government has developed a policy on the use of subsurface horizons for industrial waste disposal. Use of the Detroit formation is to be phased out and only the Cambrian will be considered in the future. Also, the types of wastes which can be pumped underground will be restricted in the future.

1973

Disposal of industrial wastes in the Detroit River formation is being phased out and in accordance with regulation 152/73 under The Environmental Protection Act is to be terminated by April 1, 1974.

According to this same regulation, the discharge of brines to lost circulation zones in the Detroit River formation will no longer be permitted after April 1, 1974. Although brine is compatible with the fluids in the formation, discharge into these so-called lost circulation zones is risky in that fresh water horizons may be invaded. The numbers of wells injecting brine will be substantially reduced after the April 1, 1974 date.

While disposal in the Cambrian formation, which occurs at greater depths and which affords greater protection from contamination of ground and surface water is being considered, the principle of utilizing this resource to a limited extent will be applied. Only wastes which are untreatable or cannot be disposed of in other ways will be injected and then only if compatible.

(xvi) National Effluent Regulations

1971

With the formation of the Federal Department of the Environment and the amendment to Section 33 of The Fisheries Act in 1970, Ottawa entered the pollution control field. National effluent standards are being developed and promulgated for certain select industry groups. Standards have already been promulgated for the chlor-alkali industry and the pulp and paper industry. Similar action is underway in the oil refining, mining and fish processing industries. Effluent standards for other industrial classifications will be developed in time.

Ontario has played a major role in advising its Federal counterparts on the effluent regulations. In the main, discussions at the technical level have been successful in resolving many differences. However, it should be pointed out that there are some fundamental differences of philosophy on which standards are being developed. Staff believe that 'poor' water management practices will result in some instances and therefore, certain regulations may be inappropriate in Ontario. Presuming that Section 33 of The Fisheries Act is to be administered in Ontario by the Ministry of the Environment, this might prove to be embarrassing in that enforcement of the regulations may not be in the best interests of Ontario.

1973

In the late Fall of 1973, Regulations and Guidelines for the Petroleum Refining Industry were promulgated by the Federal Department of the Environment, under Section 33 of The Fisheries Act. All 'new' or 'expanded' refineries will be subject to regulation whereas existing refineries will be expected to comply with guidelines. These regulations and guidelines are concerned with the control of substances which are deleterious to fish and in this sense, are limiting. The Province, on the other hand, has the ability to superimpose additional requirements where adverse effects on water quality may be a problem.

As with the regulations for the pulp and paper industry, emphasis is placed on producing non-toxic effluents and industry must now expect to become proficient in the use of bio-assay techniques to monitor effluent discharges.

Ontario, together with other provincial environmental agencies and industrial representatives, participated in the development of the regulations and guidelines. It has been agreed that the regulations and guidelines will be administered in Ontario by the Ministry of the Environment in cooperation with the Ontario Regional Office of the Federal Department of the Environment.

Regulations and guidelines are being prepared for the Mining Industry, the Metal Finishing Industry, the Organic Chemical Industry, the Heavy Chemical (Inorganic) Industry, the Textile Industry, the Meat Packing and Rendering Industry and the Food Processing Industry. The Province is invited to participate in the development of these regulations and guidelines in most cases.

Ontario expects to administer in the Province all Federal regulations and guidelines as they are developed. Although Ontario still adopts the position that 'poor' water management practices will result by the implementation of regulations which may be inappropriate for Ontario's water, this has not been a problem to date. It is expected that any conflicts of interest can be resolved by maintaining close liaison with the Ontario Regional Office and thereby avoiding any embarrassment to either Government.

(xvii) Mercury

1971

In 1969, the OWRC discovered high concentrations of mercury in the bottom sediments of the St. Clair River below Dow Chemical of Canada, Limited. Investigations were started at Dow and at other chlor-alkali manufacturers in the Province to pinpoint the sources and magnitude of mercury losses to the aquatic environment. Analysis of effluents had only shown minor traces of this material in the past. That same year, programs were drawn up for reducing mercury losses at all plants and were put into action. However, when it was discovered in March 1970 that mercury levels in certain species of fish below the chlor-alkali plants were higher than the allowable limit (0.5 ppm) set by the Food and Drug Administration, the pollution reduction programs were accelerated by Orders of the Minister. Mercury losses from such plants fell rapidly to trace quantities and all plants at the end of 1971 were well within provincial and national regulations.

At the same time in March 1970, when it was discovered that mercury could be converted to methyl mercury by bacteria in the aquatic environment and then concentrated in fish, mercurial slimicides used in certain pulp and paper mills were banned from use. Other industrial areas where mercury was used were investigated and appropriate controls installed to prevent losses to the environment.

Concern remains because of the large quantities of mercury lost over the years to certain major rivers such as the St. Clair and the Wabigoon River-English River system. This material is in the bottom sediments and will be released over a long period of time. Studies into feasible and economic ways of de-activating or removing the mercury are still continuing.

1973

As part of the Ministry's mercury abatement program, a comprehensive investigation into the use of mercury and mercury compounds in the Province was undertaken. Some paper mills were found to be using mercury-based compounds for slime control and to inhibit bacterial growth. These mills were requested to use alternative compounds available on the market and this source of mercury pollution has now been eliminated. Phenyl mercurial compounds continue to be used in the manufacture of paints, particularly latex base paints, to prevent degradation of the paints during storage and to provide a longer life to the paint coating. There are no discernable pollution problems associated with this use.

Earlier mercury emissions have resulted in serious impairment of a number of watercourses. The northwestern portion of Lake Erie, portions of Lake Ontario, the Lake St. Clair-St. Clair River system, the Wabigoon River and the Lower English River system and sections of the Ottawa River has produced fish with mercury contents above the 0.5 parts per million level recommended by the World Health Organization as acceptable for human consumption. Commercial fishing has been banned in these areas but sport fishing is allowed on a "fish for fun" basis.

In 1972, a government task force was established to review the mercury pollution problems in northwestern Ontario. The objectives of the task force were to suggest ways and means of informing the public of the dangers involved in eating fish taken from restricted areas, and to recommend the type of compensation or rehabilitation program that should be considered for the people in the area who were seriously affected by this mercury pollution. Problems in the Kenora area were more acute since fish taken from the polluted waters frequently formed the staple diet of native peoples living there.

In 1970, the Ontario Provincial Government lodged a civil suit for $40 million against Dow Chemical of Canada, Limited for mercury pollution of the Lake St. Clair-St. Clair River system. The purpose of the suit is to recover costs and damages resulting from the closure of the commercial fishing industry on Lake St. Clair, and to obtain the necessary funds for rehabilitation of the affected waters.

Two mercury cell operations in Sarnia and one in Thunder Bay were shut down by Dow in 1973. The two plants at Sarnia were replaced with new facilities which utilize diaphragm cells and evaporation. The small chlor-alkali plant owned by C-I-L in Hamilton was shut down in 1972 and the three remaining chlor-alkali operations have installed treatment systems consistent with the best practicable technology to reduce mercury emissions to a minimum. Each of these three plants is in compliance with both Federal and Provincial requirements.

Regulations for the emissions of mercury to the atmosphere are being developed by the Federal, Environmental Protection Service. It is anticipated that these regulations will be promulgated in the near future.

(xviii) Chlorinated Aromatic Hydrocarbons

1971

Chlorinated aromatics are of major concern to all who are aware of the disastrous effects that some of these compounds can have on fish and wildlife. DDT is such an example. In recent years, polychlorinated biphenyls (PCBs) have been discovered in significant quantities in some fish in many parts of the world, including here in Ontario. The potential adverse effects of PCBs on wildlife and aquatic biota are not clearly defined, but studies have shown that some of these effects are not unlike those produced by DDT.

An intensive survey has been done into the uses and losses of PCBs from industrial sources in Ontario. Investigations have failed to identify any significant direct inputs of PCBs into the aquatic environment. It is believed that PCBs are gaining entry to rivers and lakes via other pathways and are finally ending up in the fish, reflected by the concentrations that are being found.

Until recently, the major proportion of annual PCB usage (35,000 pounds) in Ontario was for incorporation into sealants, caulkings and as a plasticizer in plastics formulations. These uses represented "open-ended" systems with a great potential for PCB input to the environment. Consequently, the Monsanto Company, the only North American manufacturer, withdrew from the market those compounds used for these applications. In so-called "closed systems", a reclamation service is offered to users of PCB-type transformer fluids and heat transfer media.

Because of the large bio-magnification factor and their extreme stability in the environment, studies are continuing in Ontario to determine the 'secondary' sources of PCBs to the environment.

1973

Concern in this area has been mainly directed towards the presence of polychlorinated biphenyls and pesticide residues in the aquatic environment.

The use of pesticides and herbicides is controlled by regulation and certain of these materials have been banned for use in Ontario.

Losses of polychlorinated biphenyls to the environment have been controlled by voluntary restrictions imposed on the part of manufacturers, suppliers and users.

Current indications are that chlorinated hydrocarbon residues are widely distributed and ubiquitous in the environment. Greater attention is now being directed towards manufacturing processes for all classes of chlorinated hydrocarbons with the potential for chlorinated aromatic hydrocarbon losses as intermittent waste products. Manufacturers have been made aware of this potential problem and have initiated appropriate investigations.

(xix) Metals

1971

Increasing attention has been paid to metals since the mercury problem arose in Ontario. Studies have been conducted on the quantities of metals discharged to municipal sewer systems by industries and which are discharged in the treated effluents to watercourses, or end up in the waste sludge at the STP for disposal elsewhere. Some concern exists in applying sewage treatment plant sludges on agricultural land, for high concentrations of metals have been found in sludges from certain municipalities which have a number of metal plating and finishing operations. In base mining operations in the Province, chemical treatment for precipitation of metals is being pursued actively. Studies into cadmium, a metal considered to be as toxic as mercury, have shown no significant industrial discharges. In the Sudbury area, work is being done to assess the significance of airborne fall-out of metals into receiving rivers and lakes from smelters in the area. The fall-out of metals is also associated with other contaminants, one of the apparent effects being a drop in pH values of nearby lakes. Altogether, work is progressing on many fronts on the levels of metals such as copper, chromium, zinc and lead in receiving waters.

1973

The environmental effects of metals discharges from a wide variety of industrial sources continues to be the subject of investigation.

In the metal finishing industry, emphasis is being directed towards in-plant control and recovery as an alternative to effluent treatment. In the future, further emphasis on this approach will be dictated by increasing cost of metals and more stringent enforcement of municipal regulations of metal finishing waste discharges.

Agricultural experts are becoming increasingly concerned regarding the disposal of municipal sewage sludges on farm land due to the metals content. Negotiations are continuing between officials of the Ontario Ministry of Agriculture, Agriculture Canada and the Ontario Ministry of the Environment to develop acceptable guidelines and regulatory procedures for sewage sludge disposal.

Utilizing the best available and most up-to-date information, a set of Receiving Water Quality Objectives for heavy metals was developed primarily for inclusion in the Effluent Guidelines for the Mining Industry. These objectives will probably be incorporated into the Ministry's Receiving Water Quality Criteria in the future:

Receiving Water Quality Objectives

(mg/l)

Parameter	Hard Water	Soft Water
Chromium (Dissolved)	0.5 (0.05)*	0.5 (0.05)*
Cobalt (Dissolved)	0.5	0.5
Copper (Dissolved)	0.07	0.03
Iron (Dissolved)	0.3	0.3
Lead (Dissolved)	0.1 (0.05)*	0.05
Nickel (Dissolved)	1.0	0.4
Zinc (Dissolved)	0.2	0.02

*Public Surface Water Supply Objective.

(Further details concerning these objectives are available in the Effluent Guidelines for the Mining Industry.)

(xx) Specialty Chemicals

1971

Specialty chemicals are used by industry for specific purposes such as corrosion control, boiler feed water treatment, foam depressants and slimicides.

Since 1970 when the bio-magnification effects in fish of small amounts of mercurial slimicides used by the pulp and paper industry was discovered, greater attention has been focussed on the types of specialty chemicals being marketed for use in Ontario in terms of their potential impact on the aquatic environment.

Toxicity and other pertinent data have been assembled on mine-mill reagents. Also, data are being accumulated on the nature, usage and potential environmental effects of chemicals used in the pulp and paper industry, for those chemicals proposed as oil spill treating agents and for chemicals used in water treatment and conditioning.

It is hoped that this information will provide a factual basis for considering the usage of various classes of specialty chemicals in terms of their environmental effects.

1973

As a result of previous investigations into the nature, extent and potential environmental effects of chemical specialty usage, there is an increasing awareness on the part of industry of the potential adverse effects of the usage of such chemicals. Communication is being maintained with industry, relevant trade associations, chemical specialty manufacturers and other agencies to maintain this awareness.

No specific legislative controls on chemical specialty usage have so far been found necessary in Ontario. There is, however, impending Federal legislation on the manufacture and distribution of materials designated as "environmental contaminants". This legislation will probably be administered by the Provincial Government in Ontario.

BASIC IRON AND STEEL

The major steel producers in the Province of Ontario are Stelco, Dofasco and Algoma Steel located in Hamilton and Sault Ste. Marie. These mills have in some areas been pioneers in the steel industry both in process technology as well as in waste control.

Stelco

A few years ago, the waste control facilities in the coke oven area of Stelco consisted of an ammonium sulphate fertilizer plant and an extraction-type phenol recovery plant. The existing facilities can be described as, indirect gas cooling, total recycle of coke quench, ammonia recovery and discharge of the flushing liquor to the City of Hamilton sewage treatment plant. The remaining problems in this area consist of isolation and correction of miscellaneous discharges.

Historically, clarifiers have been used to treat gas cleaning wastes in the blast furnace area. With the recent completion of 2 additional clarifiers and segregation of clean and dirty wastes on the final blast furnace schedule for early 1974, the Company is ready to begin recycling blast furnace wastes. It is intended to use indirect coolers which will be the first such system in a steel mill. Recycle on one furnace is expected by mid-1974 and on the remaining furnaces by 1975. The type of treatment for the blow-down is unresolved.

Hot rolling wastes have conventionally been treated by scale pits for recovery of the iron values. Later developments added lagoons or clarifiers to the effluents, and present technology provides deep bed high-rate filters. The Company has one such facility in operation and a second 50,000 gpm nearing the construction stage. This leaves 2 mills, #2 Rod Mill and the 148" Mill, with lagoon-type systems.

Stelco was one of the first mills to switch to hydrochloric acid pickling with regeneration of the acid. Of the three pickle lines, the rinse waters from the largest are re-used in the acid regeneration plant and rinses from the other two are discharged, but will be included in the filtration plant nearing construction. Periodic spills of acid do occur.

In the Cold rolling areas, a plant to treat and remove soluble oils is in operation, and ion exchange is used to remove chromium from the electrolytic tin plating lines. A series of pumping stations and pipelines is used to centrally collect both dumps which are hauled to a disposal site. The most significant problem remaining in this area is a phenolic discharge originating with the electrolyte used in the tin lines.

With respect to sanitary discharges, the west half of the plant is satisfactory and the east section is scheduled to be completed by early 1975.

The Company operates finishing plants in locations other than Hamilton. By trucking pickle acid back to Hamilton for regeneration, use of a filtration plant, and use of municipal sewer systems these plants are generally satisfactory.

Dofasco

The coke oven waste control facilities include indirect gas cooling, recycle of coke quench, ammonia recovery and biological treatment of flushing liquor prior to discharges to a large terminal lagoon. The main problems to be resolved are the concentrated wastes generated by the cyanide and Stretford coke gas cleaning systems, part of which is presently hauled to a disposal site, and isolation of miscellaneous wastes.

Blast furnace gas cleaning wastes are treated in a clarifier and terminal lagoon. Segregation of clean and dirty wastes on each blast furnace is scheduled for completion by mid-1975, and investigations into cyanide control with and without recycle are underway. Partial recycle could be in operation by late 1975 and total by the end of 1976. However, studies may show that some furnaces on recycle and some on "once-through" is the preferred approach.

Gas cleaning wastes from the steel-making furnaces are pumped quite a distance for treatment in a clarifier and terminal lagoon. This is a severe mechanical service for the pumps and pipeline but the reliability is extremely good. The problem to resolve is whether the existing pipeline can be descaled adequately or whether a standby line is required.

Hot mill wastes are treated in a high-rate deep bed filtration plant which has experienced severe mechanical problems. These are expected to be resolved in 1974, but a complete review of the hot mill water balance may dictate an extension to the filtration plant.

Similarly, start-up problems were experienced with the acid regeneration plant, but these have been resolved. Accidental losses of acid do occur.

A waste treatment complex to serve the cold mill is nearing completion. This will include soluble oil treatment, ion exchange, treatment of batch discharges and treatment of rinse waters including acid rinses. The oil treatment section of the plant is scheduled to start-up in early 1974 with the entire plant operating by the end of the year.

With respect to sanitary sewage, approximately 80 percent is presently directed to the City of Hamilton system and there is a continuing program to collect the remainder.

Algoma Steel

Existing waste controls at the Algoma mill in Sault Ste. Marie consist of a phenol recovery plant in the coke oven area and clarifiers to treat the blast furnace and steel furnace gas cleaning wastes. Scale pits serve the hot rolling areas and a new basic oxygen steel facility is equipped with cooling towers and some recycle. Pickle acids are trucked to a disposal area. There is also an elaborate in-plant system for oil removal, with terminal basins which provide additional oil removal for the majority of the flow from the operations.

All sanitary wastes have been segregated and are discharged to the municipal system in Sault Ste. Marie.

As part of a planned mill expansion, a new coke oven plant is to be built. This plant will incorporate the latest technology including, indirect gas cooling, and ammonia removal. The phenol extraction plant will continue to operate also. Coke quench wastes will be directed to treatment by the end of 1975 and, resulting from all of these activities, the quality of water discharged from the coke oven area is expected to be acceptable by the end of 1976.

In the cold mill areas, extensive waste segregation and facilities to remove oil and suspended solids are expected to be complete by the end of 1974.

Atlas Steels

Atlas Steels produce specialty steels, but do not produce iron or coke. Due to economic and technical difficulties, progress in waste abatement has been slow.

Due to the location and layout of the plant, sewer segregation is a difficult undertaking involving tunnelling under parts of the plant. This work is partially complete.

A number of alternative waste treatment systems have been considered and the current program is to decide upon a system and carry out the engineering work in 1974 so that construction can commence in 1975.

Pickle liquors are presently hauled away for disposal as the types of acids used do not lend themselves to recovery. An alternative method of disposal is required.

Lake Ontario Steel Company Limited

Sedimentation basins are used to recover iron oxide particles originating from descaling operations and suspended solids which are scrubbed from furnace exhaust gases. The level of suspended solids in the final discharge to Lake Ontario generally meets Ministry requirements.

As a result of melting scrap, heavy metals are carried over in the furnace exhaust gases and go into solution in the scrubber waters. This discharge of dissolved heavy metals will be eliminated when the wet scrubber system is replaced by a dry baghouse in 1974. The operation of the sedimentation ponds is expected to improve also.

ELECTRICAL ENERGY

During 1972 and 1973, the Ministry has achieved significant progress in areas related to impact assessment, public participation definition of environmental study needs, investigation and documentation of the energy/environment interface, and clarification of the Ministry role relating to radioactivity releases.

Even though the Ministry of the Environment does not yet formally require environmental impact assessments for major projects, Ontario Hydro has submitted environmental assessments for a proposed new generating station at Wesleyville and for the doubling in capacity of the Pickering Generating Station. In both cases, public meetings were held to obtain public input to the decision-making processes. Public meetings have been held also in Thunder Bay to obtain public input to the selection of a site for a new generating station in that area.

Although the design, construction and operation of nuclear facilities is regulated by the Atomic Energy Control Board, the Ministry of the Environment is interested in releases of radioactive materials by virtue of its role in the maintenance of environmental control in Ontario. Based on agreement-in-principle with the Control Board that the Ministry should undertake certain environmental management activities at nuclear facilities, a consultant will be retained by the Ministry to provide information on the manpower, material and budget requirements needed to undertake this role.

A major report, "The Impact of Energy Use on the Environment" was prepared by a Task Force of the Advisory Committee on Energy in which Ministry representatives participated. The report is a comprehensive documentation of the environmental effects accompanying the production, transmission and utilization of energy.

Despite the change in emphasis associated with the problems of electrical energy generation, thermal pollution will continue to be of concern and, in particular, the use of once-through cooling will be the subject of studies for many years to come.

FOOD PROCESSING AND RELATED INDUSTRIES

In general at the end of 1973, all food processing plants and related industries in Ontario had implemented acceptable effluent control programs and installed the necessary waste treatment systems to handle their wastes. Present problems associated with this industry are normally the result of spills and upsets and are not due to lack of treatment facilities. The Ministry is now concerned with trying to upgrade existing treatment systems and convince the industry of the need of contingency programs to handle plant anomalies. In 1973, only $41,000 was spent by the entire industry for water pollution control which indicates that most of the major pollution problems have by now been resolved.

Many of the industries in these categories have located in municipalities to take advantage of available municipal sewage treatment facilities. The wastes from this industry are largely organic in nature and are usually quite amenable to treatment at municipal plants following some form of pretreatment. Pretreatment may consist of screening, equalization and aeration. Overloading problems at sewage treatment plants may be overcome also by discharging the process wastes to the sewer at night when there is excess capacity at the plant.

Milk Processing

The food processing industry in general has undergone a significant change in the past decade as many of the smaller rural plants have been phased out of operation. This can best be seen in the milk processing industry where the modern trend has been to construct larger and more complex plants capable of producing a variety of milk products such as cheese, cream, butter, etc., rather than having these same items produced in individual plants scattered throughout the community. In southeastern Ontario, there are approximately 25 milk processing plants left as compared to approximately 150 plants which were operational two or three years ago.

Since the larger milk processing plants have been recently constructed, good waste control measures have been incorporated in their design. Process changes in the industry, such as the use of tank trucks rather than milk cans, continuous pasteurization machines, use of non-breakable carton milk containers, etc., have all helped to reduce product losses to the sewer. Also because the new plants tend to make a full use of all the by-products (e.g., skim milk, buttermilk, etc.), there are fewer wastes to handle and the economic status of the plants has improved. The improved economic status has enabled waste treatment facilities to be installed.

Whey produced during the manufacture of cheese has long been a difficult by-product to dispose of. Whenever possible, whey has been used as an animal feed or has been sprayed on dirt roads for dust control. More recently,

however, protein sources have become very costly and as a result the drying of whey to recover protein has become an economically attractive proposition. A request has been submitted to ODC for a grant for a new whey drying plant to be constructed in the Kingston area to utilize the whey produced at the rural cheese plants. If this new plant is found to be successful, the whey disposal problems may at last be overcome.

Canneries

Canneries have always posed a difficult waste handling problem because of the strong organic wastes which are generated during a relatively short operating season. These wastes can create serious pollution problems because they are released during the warmer weather when the dissolved oxygen levels in the receiving waters are usually already low. Also, because these wastes are released during the summer months when the watercourses are used extensively for recreational purposes, any problems become readily apparent to the general public. All canneries, therefore, either discharge their wastes to the sanitary sewer or operate private waste treatment systems.

The organic wastes released from the canning industry are generally amenable to biological treatment. Because of the expense involved, biological treatment systems have been installed only by the larger plants which operate year-round and produce such side items as pork and beans, macaroni dinners, soups, etc. Wherever sufficient land is available, spray irrigation has been used successfully by many medium-sized plants. Small canneries which only operate 8-16 weeks a year have installed holding ponds. These ponds are designed to retain the entire season's waste production over winter period for release to the watercourse the following spring during the spring run-off.

By the end of 1973, some form of effluent control was operational at all the canneries in Ontario and, for the most part, direct discharges of process wastes from the industry to the watercourses has been eliminated.

Breweries, Distilleries and Wineries

These industries produce strong organic wastes which require treatment prior to disposal. Where possible, these wastes are discharged to a municipal sewage system, either with or without pretreatment. In cases where municipal facilities are not available, the plant is required to install and operate suitable waste treatment facilities. At the end of 1973, all plants had either installed the necessary pretreatment facilities to enable their wastes to be discharged to the municipal system or had installed waste treatment facilities. Both aerated

lagoon systems and the activated sludge process have been successfully employed.

Meat Processing

Many of the meat processing plants are located in municipalities with sewage treatment facilities and hence discharge their wastes to the sanitary sewers for treatment. Small custom-killing plants are still operated and are widely scattered throughout Ontario. The wastes from these relatively small operations are normally treated in septic tanks or total retention lagoon systems. All of the large bird processing plants located in rural areas have installed treatment systems within the last 2-3 year period and, as a result, major waste disposal problems in this area have also been eliminated.

Tanning and Rendering Processes

Where municipal sewer systems are available, these industries discharge wastes to the municipal system, usually following adequate pretreatment. Two rendering plants in the Province have installed their own waste treatment facilities consisting of a total retention lagoon system in the one case, and a lagooning and spray irrigation system in the other. Most tanning liquors are discharged to municipal systems following precipitation of the chromium. The chromium sludges are normally hauled away for disposal at landfill sites. There are still some tanneries which discharge tanning liquors to watercourses but programs have been established for eliminating these discharges.

A major problem of odours still remains with this group of industries.

METAL FINISHING AND PLATING INDUSTRY

Metal Working and Finishing

This industry includes sections of the automobile and iron and steel industry in addition to the small and more widely dispersed light industrial activities of milling, turning, drawing, stamping, pressing, painting, etc. Wastewaters from metal finishing operations contain free oils, emulsified oils, acids, alkalis, metal particles and plating and painting sludges.

The traditional treatment of wastewaters from these operations has been lagooning and discharge from a submerged weir. This practice is now being largely superceded by treatments involving free oil separation in correctly designed oil separators, pH adjustment, emulsion breaking and filtration through multi-media filters. These practices have enabled Ministry effluent objectives to be met at locations where wastewaters are discharged directly to a watercourse and wastewater recycling to be implemented at some locations.

Metal Plating

In Ontario, metal plating is carried out exclusively by some companies and in conjunction with metal working and finishing operations by other companies. Wastewaters from the process operations contain a wide range of metals, cyanides, acid, alkalis, phosphates, oil and metallic particles.

Metal recovery rather than treatment and disposal has been recognized as an ultimate goal for the metal plating industry. Companies have been encouraged consistently to practice metal recovery and water conservation and reuse. These practices have been implemented by many companies and extensive evaporative recovery of chromium and nickel is now carried out in Ontario.

Ion exchange is also used for metal recovery, primarily to concentrate dilute wastewaters prior to batch treatment of the resultant concentrated waste materials. It has been recognized that batch treatment methods are safer than continuous in-line treatment of dilute wastewaters, particularly in the use of smaller companies which do not employ technical staff capable of servicing complex in-line continuous treatment equipment.

One of the major problems associated with the metal plating industry has been the occasional accidental discharge of highly concentrated process solutions. Companies are encouraged to install suitable fail-safe equipment and protection devices to prevent this type of accidental discharge.

All metal finishing and plating plants in Ontario discharging wastewaters to natural watercourses have installed facilities capable of treating their wastewaters

to levels which comply with current Ministry objectives.

Seventeen certificates of approval were issued for works installed in 1972-1973 at a cost of approximately $3 million. The Steel Company of Canada, Limited, Hilton Works, installed an ion exchange system for the recovery of chromium on an electrolytic tinning line. This installation now recovers several hundred pounds of chromium per day which was formerly discharged to Hamilton Harbour.

Federal Regulations and Guidelines

Regulations and Guidelines for the Metal Finishing and Plating Industry are being developed currently by Environment Canada. These regulations will establish a natural base-line level for the control of contaminants from these operations and will impact most severly in Ontario where 80 percent of the industry is located. A questionnaire designed to assess the extent and nature of existing controls and the waste loadings contributed by various processes, was used to survey the industry. The Ministry cooperated in this survey and is expected to participate in a task force that will be established to review the findings of the survey and develop the regulations and guidelines.

MINING

There are over 100 active mining operations in the Province and environmental problems associated with the discharge of mine-mill wastewaters are common throughout the industry. Some of the highlights of the mining program are discussed below.

Ontario Mining Regulations

"Effluent Guidelines and Receiving Water Quality Objectives for the Mining Industry in Ontario" were issued by the Ministry towards the end of 1973. Nearly all of the mining operations in the Province discharge wastewaters to natural watercourses but at the end of 1973, most of these operations were in compliance with the Ministry's guidelines with respect to pH, suspended solids and the common heavy metals (copper, lead, zinc and nickel). However, due to inadequacies in waste treatment technology, most operations could not meet the guidelines with respect to ammonia. The use of ammonia-based explosives at nearly all operations contributes ammonia to mine wastewaters.

Failure of Mine Waste Retention Facilities

No major failures of tailings dams were experienced in the Province. A small liquid waste retention facility failed at a copper property north of Sault Ste. Marie and legal action is under consideration.

Wastewater Recycle

During 1973, the Ministry began to request wastewater recycle in the mining industry. By the year's end, a total of 6 mining operations in Ontario were re-using tailings area decant waters in their respective mills. Commitments for re-use of decant water from 3 other properties have been made. For valid technical reasons, decant water re-use in the gold and uranium industries is not carried out to any extent. On the other hand, wastewater re-use is carried out extensively in the 8 iron ore operations in the Province.

The Gold Industry

The wastewater discharges from the 11 gold operations in the Province for the most part did not meet the guidelines of the Province. Control of cyanide, copper, zinc and arsenic discharges presented the main problems. Waste treatment technology is not sufficiently well advanced in the gold industry and this, more than anything, accounts for the poor quality of the effluents. A program has been initiated to resolve the problem.

The Uranium Industry

Of the 10 substantial uranium properties which have been active in Ontario, 8 are now abandoned. Three abandoned properties in the Bancroft area do not present

significant problems but the active and abandoned properties in the Elliot Lake district continue to result in contaminated waste discharges to the environment.

A total solution to the problems in Elliot Lake is not possible at present because the waste treatment technology for the removal of dissolved solids and ammonia is not sufficiently developed to the point where it can be applied to the mining industry. The Elliot Lake uranium industry is also subject to acid mine drainage problems.

Following extensive laboratory testing a report "The Use, Characteristics and Toxicity of Mine-Mill Reagents in the Province of Ontario" was issued by the Ministry. This report provides basic information on the chemistry and toxicity of nearly all chemicals commonly used in the mining industry in Canada.

THE PETROLEUM AND PETROCHEMICAL INDUSTRY

This industry continues to practice a high degree of control over those waste constituents such as oil, phenols, etc., commonly associated with petroleum and petrochemical processing.

However, problems with respect to toxicity to aquatic life, the tainting of fish flesh and general concern for high dissolved solids losses that have been identified during 1972 and 1973 have presented the industry with a new set of priorities. This is reflected in Federal regulations and guidelines for the petroleum refining industry which were developed in cooperation and consultation with Provincial environmental agencies and industry representatives. Similar guidelines and regulations are being developed for the organic chemicals industry.

The current shortage of crude oil in Eastern Canada has significantly affected the industry in Ontario. From an environmental standpoint, the most significant effects have been:

(1) the shipment of crude oil from Ontario refineries to Montreal via the St. Lawrence Seaway and the Great Lakes;

(2) increased crude oil refining to meet demands in Eastern Canada;

(3) expansion of existing refineries and the proposal for one new grass roots refinery and a major new petrochemical complex; and

(4) the proposals for a new pipeline to bring more Western Canada crude oil into Ontario and to extend the existing line from Ontario to the Montreal refineries.

The shipment of crude oil from Ontario refineries to Montreal presents problems in that ballast water treatment facilities are sometimes not adequate to handle the waste flows from large oil tankers. It should be emphasized that these are not the super-tankers commonly associated with shipment of oil on the ocean but they are nevertheless larger vessels than those usually used for shipping products from the Ontario refineries.

It is anticipated that this shipment of crude oil will be continued until a pipeline is built from Ontario to Montreal, probably for the next two years. Consequently, companies have been required to upgrade their ballast water handling and treatment systems prior to the 1974 shipping season.

Increased production at most refineries has been accomplished with little degradation in effluent quality. Major expansions in crude processing capacity at B.P. Canada Ltd. in Oakville and at Sun Oil Company in Sarnia will be accompanied by facilities to collect and treat the anticipated increased waste flows and loadings.

The new crude oil pipelines have been the subject of some preliminary discussions with respect to the possible environmental impact of the various route alternatives. These discussions are continuing to finalize recommendations to be presented to the National Energy Board.

Proposals have been presented by Texaco Canada Ltd. for the construction of a major oil refining complex in the Nanticoke area on Lake Erie. The refinery will include the most advanced waste treatment technology to meet the stringent effluent requirements which were a condition of the acceptance of the proposal. The Company is proceeding with the final design of the facilities and formal application for approval of the engineering design is expected early in 1974.

Proposals have also been received for the construction of a world-scale olefins and aromatics manufacturing facility, the Sarnia Olefins and Aromatics Project, by the principals, Polysar Ltd. and Du Pont of Canada Ltd. This will involve the construction in Sarnia of a 123,000 bbl/day crude oil topping unit and a 53,000 bbl/day naptha cracking facility. Associated with these facilities will be pyrolysis gasoline hydrotreating and aromatics recovery. The total cost of the project is estimated to be in the order of $145 million. Extensive waste controls and treatment will be included with the complex which will encompass the best practicable waste treatment technology available.

PULP AND PAPER INDUSTRY

Since the previous Status Report of December 1971, there has been much activity in the pollution abatement field in this industry.

Suspended Solids

Eight mills have installed mechanical clarification systems at an estimated cost of $10.5 million. Two clarification systems and one dissolved air flotation system, valued at $3.7 million, are under construction and should be completed shortly. Also, one clarification system and one dissolved air flotation system have received Ministry approval and will be constructed during 1974.

Two small board mills have indicated a willingness to install facilities following extensive investigations. One of the mills is expected to install a Sweco Centrifugal Wastewater Concentrator and the other a clarifier. However, in the case of the latter, funds are not available. A small roofing felt mill located in Thorold, is still trying to determine the optimum solution to its suspended solids problem. Ideally, discharge to the municipal system would solve the problem but the municipality has not been willing to render a decision to date.

Suspended solids discharges will be well under control by the end of 1974 when the projects presently underway are complete. However, although most mills have, or will have, primary treatment facilities installed, only in a few cases will the resulting effluent meet the Ministry's 50 mg/l requirement. Increased treatment facility efficiency and, in some cases, additional treatment facilities will be required.

Biochemical Oxygen Demand

Progress in the field of BOD_5 reduction has been slow and has been limited mainly to studies on biological oxidation of spent sulphite pulping liquors.

The first Copeland System for fluidized bed incineration of spent sodium-base sulphite pulping liquors was installed by The Ontario Paper Company Limited in Thorold. Due to the complexity of the mill's by-products operations, the incineration system is unique in that the organic solids to inorganic solids ratio in the feed liquor is much lower than normally associated with spent liquors. This has resulted in a number of problems, particularly with the evaporation system, but the Company expects to have the whole system running well before long.

A number of studies both bench scale and pilot plant scale, into biological treatment of spent sulphite liquors have been conducted. Variations of the activated sludge process, the facultative aerated lagoon, and the biodisc have been tried on a variety of sodium-base and magnesium-base spent liquors. In no case has a system proven completely successful. There is no doubt that con-

centrated spent pulping liquors can be degraded biologically but problems in handling the large amounts of bio-sludge produced have been acute. Also, it is apparent that filamentous growths tend to predominate and create severe problems in solids-liquid separation. It appears unlikely that bio-treatment of concentrated waste sulphite liquors will prove to be a successful solution to the problem.

A number of pilot plant studies on the biological treatment of kraft mill wastes have been conducted. Of note is a study conducted in cooperation with Environment Canada on the treatment of kraft mill condensates and combined bleach plant effluent by the Attisholz process. This process appears to work well, can resist shock loadings and is efficient. However, biological treatment alone does not reduce toxicity to the level required by the Federal regulations. More work is required to develop a system capable of reducing toxicity.

Following the research work performed by Domtar at the Cornwall mill to identify sources of taste, odour, fish flesh tainting and toxicity, Domtar is constructing condensate stripping systems at its mills in Cornwall and Red Rock. When these strippers are operational, an evaluation will be made to determine what additional treatment facilities are required. At this time, it is envisaged that biological treatment of bleach plant wastes will be required.

In addition to these installations, three other kraft mills are studying the feasibility of condensate stripping for their operations. In each case, the Ministry is encouraging the mills to install condensate stripping as soon as possible.

Other studies on the treatment of kraft mill wastes have included the use of fly-ash as an adsorbent and the use of SO_2 to treat bleach plant wastes. Neither proved to be very successful although there were indications that the SO_2 route had some merits.

Toxicity

The Federal regulation for toxicity continues to prove difficult to administer. Environment Canada, through grants and the CPAR program, has sponsored a number of studies on the toxicity problem. A much better understanding of the problem and identification of many of the toxic waste components have resulted from these studies. However, at the present time, the facultative aerated lagoon is the only biological treatment process that appears capable of producing an effluent in compliance with the toxicity regulation. In-plant treatment to remove the toxic components at source is potentially a viable alternative.

Mechanical Refining

A potential solution to the pollution control problems associated with sulphite pulping is to replace sulphite pulps with mechanically refined pulps. Technology has now progressed to the point where a number of mills are seriously looking at the potential of refined pulps to replace chemical furnish in the manufacture of newsprint.

In Ontario, two mills have announced plans to install a 200 ton per day and a 100 ton per day, respectively, pilot mechanical refining unit with the intention of phasing out the sulphite pulping operations if the trials prove successful.

Colour

Coloured effluent discharges, particularly from kraft mills, continue to present a real challenge to the Ministry. The Ministry does not require colour reduction at this time because there does not appear to be viable process available. Research in Sweden indicates that ion-exchange may yield a viable process in which case the Ministry would be in a position to develop a suitable requirement for colour removal.

Economics

During 1972 and 1973, it was apparent that the Pulp and Paper Industry was suffering an economic recession and that the funding of environmental control projects would be difficult. For this reason, the Ministry undertook a preliminary study which attempted to define the magnitude of capital investment required and the benefits which would accrue. Following this initial work, a more detailed and sophisticated study is being conducted by two economists from the Ministry's Strategic Planning Branch. One of the main objectives of this study will be to detail policy objectives for the Ministry in light of the current economic scene.

New Mills and Expansions

A number of new mills and major expansions have been announced for the industry in Ontario. Briefly these are:

(1) Great Lakes Paper - a new 750 ton per day kraft mill and a waferboard mill at Thunder Bay.

(2) Macmillan Bloedel - a waferboard mill at Thunder Bay.

(3) Weldwood of Canada - a particle board mill at Longlac.

(4) Domtar - a particle board mill at Huntsville.

(5) Dryden Paper - a 120 ton per day expansion of the facilities at Dryden plus a new 750 ton per day kraft mill in Red Lake.

In all cases, negotiations are on-going with the Ministry to ensure that all environmental concerns are being accounted for.

Biological Oxidation Facility - Fort Frances

The facultative aerated lagoon which commenced operation in November 1971 coincident with the start-up of the new, 500 ton per day kraft mill has not performed well to date. The system has been plagued with a variety of problems. Overloading due to poor mill operation, insufficient oxygen, mechanical failure of aerators, entrainment of foam by the wind, odour problems and a major mill strike are just some of the reasons associated with the poor performance.

Additional aerator capacity has been installed and a program of liquor spill elimination within the mill has been undertaken to try to improve the lagoon operation. A system of sprays to wet-down the foam has been installed to eliminate the foam entrainment problem.

It now appears that most of the problems have been overcome and the Ministry is hopeful that the facility will begin to operate according to design very shortly.

CONTINGENCY PLANNING

A report entitled "The Province of Ontario Contingency Plan for Spills of Oil and Other Hazardous Materials; Status Report May 1973" was published. This report promulgated several newly-developed concepts, including a re-definition of the magnitude of spill incidents and thereby a re-definition of Provincial involvement in major incidents, the establishment of ten Regional Response Teams under the Provincial Plan, and the development of guidelines for the use of chemical oil spill treating agents. The Ministry, on behalf of the Province of Ontario, made certain commitments of response participation under the joint Canada-U.S., and the Federal contingency plans. Negotiations were also initiated for the development of a joint Ontario-Quebec Contingency Plan.

Future concerns of the Ministry include the establishment of 8 additional regional response teams in spill-sensitive, high-risk areas and the re-writing of the provincial "Contingency Plan for Spills of Oil and Other Hazardous Materials". Also, to help those involved with contingency planning to better understand the complexities and roles of various government agencies, and the commitments of various agencies under international, national, provincial, local or other plans and agreements, a workshop will be held during 1974. This workshop will be jointly sponsored by the Ontario Ministry of the Environment and Environment Canada. Consideration will be given to holding this workshop on an annual basis to provide a platform for the exchange of information in this rapidly-developing field.

As a result of problems encountered during recent months, it is recommended that a training program be established to familiarize Ministry staff with legislation pertaining to spills of deleterious substances, responsibilities and jurisdiction of other government agencies, spill control methods and countermeasure techniques, and safety.

THE CONTROL OF LIQUID INDUSTRIAL WASTES IN METROPOLITAN TORONTO

The control of industrial waste discharges in the Municipality of Metropolitan Toronto is administered by several governmental authorities. Under Metro Toronto By-Law 2520, the Metro Works Department is responsible for the quality of discharges to watercourses, storm sewers and sanitary sewers. In order to enforce this By-Law, surveillance (which includes sampling and some flow measurement) is carried out by seven teams of two men each, working swing shifts, 16 hours per day, 7 days per week.

In addition, two Boroughs, namely Etobicoke and Scarborough, have full-time industrial waste inspectors. These inspectors work in conjunctions with the Metro inspectors on specific problems within their respective Boroughs. They also carry out inspections relative to the enforcement of plumbing by-laws. One staff member of the Ministry of the Environment's Industrial Wastes Branch provides surveillance in the Metro area and works in cooperation with other government inspectors.

In February of 1972, at the suggestion of this Branch, representatives of the Metro Works Department, the Works Departments of the five boroughs and the City of Toronto, the Metropolitan Toronto Region Conservation Authority, the Sanitary Engineering and Industrial Wastes Branches of the Ministry convened and established the "Technical Co-ordinating Committee for Water Pollution Control in Metro Toronto". This Committee has become a forum for discussing matters pertaining to water pollution. Subjects such as the establishment of sewer-use by-laws, by-law enforcement programs, courses to be offered by the Ministry on various aspects of liquid industrial waste control, have been discussed at the monthly sessions.

Meetings have been both informative and congenial and allow frank and open discussions between the various levels of government.

COURSE ON CONTROL OF INDUSTRIAL WASTES IN MUNICIPALITIES

A very important aspect of controlling industrial wastes in municipalities has been a training course offered by the Ministry to municipal employees and others each year since 1969. This Course has been endorsed by the Municipal Engineers Association each year and has been upgraded in the light of experience each time. A major revision to the course entitled "Control of Industrial Wastes in Municipalities" was offered as a Certificate Course and was directed towards the further education of those municipal employees who are directly responsible for enforcement of by-laws. The Ministry considers this Course to be a vital part of its program of municipal industrial wastes control and intends to continue to offer the Course as long as the need exists.

This Course was again held in November 1973. The duration of the Course was four and one-half days as previously, but the content and format were further modified.

In 1972, a major revision of the content was undertaken and the process was continued for 1973, with much emphasis being placed on "need to know" techniques of teaching. The organization of the teaching sessions was much changed and consisted of alternating sessions in the lecture theatre and in small discussion groups. Although general sessions were held at which the entire student body attended, we endeavoured to move away as far as possible from a formal lecture approach, towards a more relaxed delivery in which the students were encouraged to seek out knowledge of a subject as far as possible by their own reasoning. In short, the students were encouraged to think rather than being bombarded with quickly forgotten details.

The discussion group sessions which followed each general session were intended to reinforce the material presented in the auditorium by allowing a format where discussion amongst the students was facilitated and where the size of the group did not inhibit questions in areas of individual lack of understanding. Group sessions were also held for specific purposes such as problem solving. A sufficient number of group leaders (Industrial Wastes Branch staff members) was available to enable groups of only 13 or 14 persons to be formed. These groups, formed on the first day by a selection process which attempted to ensure a good cross-section of municipal, industrial and government personnel in each, remained intact throughout the week but the group leaders were assigned to a different group each day. The value of this rotation of group leaders is not certain, but it was felt that it might have been useful to expose the students to a number of different approaches to the material.

Much emphasis was placed on practical matters and an afternoon was devoted to flow measurement and sampling under conditions as close as could be arranged to actual field experience. Flow measurement and sampling stations, to give practice with a variety of methods, were established along a small watercourse in the grounds of the Ministry's

Laboratories and each group of students was assigned to measure the flow and sample at each station. The results obtained by each group and the methods used to obtain the results were compared (good agreement was found).

An important additional "practical" exercise was assigned to each student to be completed on an individual basis. This consisted of an industrial wastes survey of a fictitious municipality "Newtown", in which there were three major discharges of industrial wastes to the sewer system. Problems at the sewage treatment plant were described and the students were assigned to survey the industries, determine the causes of the problems at the treatment plant and recommend solutions. All necessary information was provided and the students were allowed part of an afternoon, an evening and part of the next morning to complete the exercise.

On the Tuesday, Wednesday and Thursday mornings, a mini test was given, consisting of questions relating to the previous day's work. On the first morning, Monday, the students were asked to complete a pre-test and on the final day, Friday, a final test was given. The mini tests, the final test and the Newtown survey all contributed to the assessment of a student's performance and in accordance with our emphasis on practical matters the marking was such that no pass was attainable unless the survey problem had been completed with reasonable competence.

Due to the large variety of education and experience amongst the students, it was decided that the Certificate should be for completion of a basic course and should demonstrate competence in the basic factors of control of industrial wastes in municipalities. An advanced course may be offered in future.

This year, a reception on the Monday evening was held at the Constellation Hotel with the object of allowing the students to meet each other (and the group leaders) informally and hopefully to enhance their cooperative efforts during the course. On the Thursday evening, a banquet was held at the same hotel and apparently was much appreciated by all attending.

Sixty-nine persons registered for the Course and sixty-eight were present at the first session. During the week, two persons withdrew, but the remaining sixty-six remained to write the final examination. Of these sixty-six, fifty-eight passed the Course and only eight failed. In the majority of cases, there was improvement in knowledge and expertise as evidenced by the results of the pre-test and final test and we take this as a positive indicator of the worth of the Course.

As a final teaching aid, a complete set of answers to all questions and problems assigned is in preparation and will be sent to each participant.

An analysis of the Course was not undertaken as we feel that the only indicator of success is how competent are our graduates in control of industrial wastes in municipalities. However, from the comments which we have received, it appears that the students were surprised by the quality and amount of work expected of them, but were happy to be engaged in something which they saw as useful. They were seldom bored and disinterested and we attribute this not only to the calibre of the group leaders but to the content and organization of the Course.

EDP SYSTEMS

By the end of 1971, it had become clear that manual methods of handling data relative to industrial wastes control were not providing adequate management information in a reasonable time frame. Also, the costs of even the simplest manipulations of raw data were escalating since these manipulations were being performed by the technical staff. Therefore, early in 1972, a feasibility study was undertaken to assess whether automated data processing methods could be utilized to meet the information handling needs of the Branch. The study showed that ADP systems would indeed benefit our program and a recommendation that such systems be developed was made.

This recommendation was accepted and design of the systems commenced. By the end of 1972, the basic concepts of the Industrial Wastes data files and processing arrangements had been outlined and detailed design and programming began. As design and programming continued, detailed requirements became clearer and many changes in the basic concepts were made. The basic purpose of the system is to answer all requests for data relative to industrial wastes control, and since it is not possible to foresee the nature of every request which might be received, as much flexibility as possible has been incorporated into the system.

Since industries will be required to supply some of the data for the monitoring files, fourteen companies were approached to participate in a test program using the new system. As a result of experience gained from the test program, many changes were made often as the result of comments and suggestions by the participating companies. Late in 1973, the Field Services Section was requested to provide industry data for incorporation into the system. This work is continuing. Also, results of effluent monitoring are being received from industry and will be processed routinely as soon as the records are complete.

The effluent monitoring portion comprises Phase I of the overall system. It consists of twenty-three computer programs, producing seventeen error and data reports of a routine nature. Six data capture forms have been designed to incorporate eleven input card formats. All programs have been fully tested. Two hundred and twenty-five companies have been listed for inclusion in the system, giving rise to records for approximately 300 plants, 600 control points, and 3,600 parameters for which approximately ten results are received each month. Each month, therefore, 36,000 cards (approximately) will be keypunched when all companies are reporting. The effluent monitoring portion, Phase I, uses six of ten data files, the other four consisting of:

Industrial Waste Treatment Descriptor File
Industrial Waste Treatment Control File
Industrial Waste Control File
Industry Descriptor Library File

Development of these files is proceeding as quickly as possible. All of the foregoing has been developed for control of industrial wastewater, but in view of the reorganization of the Ministry, air and solid industrial wastes will be incorporated. However, due to the changes which this will necessitate, the completion date for the entire system has been left open at this time.